SIERRA LEONE

REPORT OF
THE DEPARTMENT OF AGRICULTURE
FOR THE YEAR 1953

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REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1953

SECTION I—INTRODUCTION AND POLICY

The urgent need for additional field officers continued to be felt, but in spite of this the work of the Department continued to go ahead with vigour. Specialist officers continued their research into specific problems, and though no startling discoveries were made, much useful work has been accomplished. Building at the Regional Rice Research Station at Rokupr was mainly completed and fitting up the laboratories began towards the end of the year. A second specialist officer arrived to take charge of investigations on deltaic soils.

2. Seven Sierra Leone members of the staff were studying in the United Kingdom at Universities and a Farm Institute. Two returned after completing a year's course at the Nottingham Farm Institute with creditable results, and a further two were sent to take the same course.

3. The main lines of development were mechanical cultivation of riverain swamps in the dry season for rice production, the planting out of improved oil palms during the rains, the distribution of fertilisers, multiplication of pig and poultry breeding stock and preliminary work in settling Fula cattle owners. Further investigations were carried out on methods of fermenting cacao, with encouraging results. The distribution of planting material and fetilisers continued, particularly seed rice for mechanical cultivation schemes. Investigations into the possibility of extending groundnut cultivation on waste *Lophira* bush were continued. A number of day-old chicks were imported successfully by air to augment existing stocks of poultry which are being increased.

4. The rains began rather earlier than normal in the eastern parts of the country, but were late in the Scarcies area. Flooding occurred early, and caused some damage to late planted swamp rice, particularly on the Little Scarcies river. The upland rice crop was less than normal. Exports of Agricultural produce were less than in 1952. The value of 80,978 tons was £5,714,554 compared with 88,076 tons valued at £6,105,178 in 1952. Palm kernels, piassava and cacao showed decreases, while coffee exports reached the record figure of 1,050 tons.

5. The policy of the Department has been furthered by the expansion of mechanical cultivation, building up the number of livestock and encouraging the use of fertilisers.

6. In general with rising costs of labour and with the movement of farm workers towards other undertakings, mechanization and the use of fertilisers is becoming a practical, economic proposition and the only possible solution to the problem of maintaining adequate food supplies. Concentration of these modern aids to agriculture is being made upon swamp rice, where best results are obtainable at least cost. There are some 300,000 acres of almost virgin grass swamps in Sierra Leone and, until a solution is found to maintaining upland fertility under continuous cultivation, only a small-scale investigation is being made into upland mechanical cultivation. The development of the swamplands alone will occupy the resources of the Agricultural Department for several years to come; it is technically sound and will lessen the strain on the already dangerously over-farmed uplands.

7. As regards upland farming the high price of coffee and cacao is causing increased planting in the whole south-eastern region, with coffee spreading everywhere including the north. The attraction of these two crops is probably having an adverse effect upon palm kernel production, nevertheless there is a good demand for improved oil palm seedlings. So long as swamp rice production can be increased the development of coffee, cacao and improved oil palms on the uplands

is all to the good and is the inevitable corollary to the policy of the Department over the last twenty-five years or more. Swampland mechanization and the use of fertilisers must increase at a rapid rate, however, if local food supply is to keep pace with upland export crop production and industrial development.

8. In the final analysis the ability of the farmers to respond to these modern techniques will determine whether or not this race with time will be successful. The same proviso exists in regard to livestock and poultry development, where a knowledge of good management and feeding could do much to counteract the effects of disease and lack of attention. The Department can and does give sound technical advice; it initiates development schemes through District Councils; it runs a large-scale mechanization scheme and improved oil palm planting programme; it produces and distributes improved seed rice and other planting material; it rears and distributes high-grade pig and poultry breeding stock. In the past it has initiated or established rice mills, pioneer oil mills, produce inspection and agricultural co-operation. It has established and developed the cacao, coffee, groundnut and piassava industries. All these have depended upon the local farmer, without his goodwill and determination to advance the agricultural development of Sierra Leone would not be even as flourishing as it is to-day. After a few years any new agricultural development and the hard work of the Agricultural Department staff is apt to be taken for granted.

9. In agricultural work, also, there are definite limitations to the speed of progress due to the seasons, the growth-rate of plants and animals, and the effects of cultivation on soil: a crop failure or a decline in any particular export crop is apt to be laid at the door of the Department and the farmers, when natural circumstances beyond their control are the real culprits. Despite these limitations the fact remains that over the years the fundamental policy of the Department has proved its worth and, in a modest way, both the farming community and the members of the Agricultural Department can feel satisfaction at what has been achieved. At the same time there is to be no resting on laurels and much remains to be done.

A—The Provision of Adequate Food for the People.

10. The most important means by which this can be achieved is by encouraging the improvement and spread of swamp rice cultivation to such an extent that not only will the needs of the people be supplied in a bad year but there will be a surplus for export in ordinary years.

(*i*) *Mangrove Swamp Reclamation:*

11. The Mangrove Clearing Loan Scheme started by the Department in 1939 was replaced by District Council schemes and winding up of the departmental scheme started. In 1954 collection of outstanding loans will be completed by staff assigned to District Councils. This will take several years as loans were repayable in instalments. In Bonthe District the District Council has replaced the original scheme by a direct felling and renting scheme and during the year some 280 acres were felled by the District Council in Imperri and Bendu chiefdoms. In Moyamba District the District Council has continued a loan scheme and some 98 acres were felled by assisted farmers.

12. Some of the farmers originally aided under the old Mangrove Loan Scheme continued to expand their farms and some seventy-seven acres in Bonthe District and 114 acres in Moyamba District were felled. Generally, however, felling of new areas is declining and there is a tendency towards fewer farmers owning large farms. This decrease in momentum is largely due to the migration of young potential farmers to areas where employment for a regular wage is available, which leaves nobody to take over farms belonging to those farmers who die, the population being low in the areas concerned. The spread of kiri-kiri (*Paspalum vaginatum*) is also discouraging farmers. Where this weed occurs heavy digging is required before planting and this they are not used to, as in the Scarcies where it is accepted practice. Preliminary experiments on this weed with hormone weed-killers were not encouraging.

13. The Rural Area Council in the Colony made further funds available which were issued as loans to assist farmers in felling mangrove on Songo Creek. £270 were issued to thirty farmers and some 200 acres were felled in 1952 and 1953 by the eighty-five farmers aided in these two years.

14. A further 75 acres was felled in the Kafu Bullom Chiefdom of Port Loko District, bringing the total to 176 acres at two sites. These were originally Native Administration schemes which are now run by the District Council.

15. At Fogboh in the Colony 300 acres were cultivated this year and steady expansion continues. Expansion also continues along Gbabai Creek in Port Loko District.

(*ii*) *Saline Swamp Development*:

16. The following table shows the progress made in the development of Saline Mangrove areas:—

TOTAL AREA EMPOLDERED IN ACRES

Year	*Scarcies*	*Year*	*Colony (Maswari)*
1949	10	1938	3
1950	105	1942	10
1951	335	1945	85
1952	*585	1952/53	150
1953	†833		

* 250 *acres empoldered using a dragline excavator.*

† 243 *acres empoldered using a dragline excavator.*

17. In the Scarcies these schemes have now been taken over by the Kambia District Council which deals with allocation, rent collection, etc., although some plots are being kept for departmental experimental work. The Irrigation and Drainage branch of the Public Works Department is still responsible for major bunds and sluices.

18. During 1953 a further 248 acres were empoldered at Mapotolon by the Irrigation and Drainage branch with dragline excavators, making a total of 498 acres at this site. Maintenance and capital charges are being carefully watched and it is only if these can be kept within economic limits that expansion can continue.

19. In general these schemes are still in the pilot stage. It is clear that on *Avicennia* mangrove land near the sea, empoldering is essential to ensure a sufficiently salt-free period to grow rice. On such areas as Bakepet, which was the first large experimental empolder, indications are that empoldering, except perhaps on a minor scale, is not essential if the drainage system is carefully and thoroughly constructed, allowing free tidal wash to remove the salt and other accumulations produced during the dry seasons. This has also been apparent on the Luti and Rosino sedge areas—where good crops of rice are now being grown under a system of free wash and improved drainage where previously bunding caused toxicity.

20. On *Rhizophora* mangrove areas it is impossible to carry out any empoldering without producing conditions toxic to rice.

(*iii*) *Inland Swamp Cultivation:*

21. Most of the numerous inland swamp development schemes designed to show the advantages of the development of swamp cultivation were handed over to the farmers to continue themselves. In the Makeni Circle, where this work has been particularly stressed, it is interesting to note that by 1952 there were eleven such schemes covering 279 acres—the first scheme having been initiated in 1946.

22. There is no doubt that these schemes have had their effect, as inland swamp rice cultivation has expanded very rapidly throughout the north and now all the most accessible swamps are cultivated. In order to encourage the development of less accessible swamps Swamp Clearance Bonus Schemes were started by the Department under the auspices of the District Council in Bombali District.

23. Fertiliser trials, particularly with superphosphate, which gives the best response generally, have been initiated throughout the country on inland swamps as well as on boli lands, and sales of fertilisers started to farmers for the first time. There is great scope in Sierra Leone for the use of fertilisers on certain areas to increase production.

24. Ox ploughing continued to be encouraged in the north and there are now seventy-four established farmers with oxen and ploughs, mainly in the Mabole Valley.

(iv) Mechanical Cultivation of Swamps:

25. Mechanical Cultivation

Districts	Acres Ploughed				
	1949	1950	1951	1952	1953
Bonthe	4	69	282	465	1,178
Scarcies (Kambia)	—	—	80	192	5
Port Loko	—	—	—	453	678
Pujehun	—	—	32	403	623
Moyamba	—	—	—	316	395
Makeni (Bombali)	—	—	—	238	915
Musaia (Koinadugu)	—	—	—	30	163
Total	4	69	394	2,097	3,957

26. During 1953 a marked expansion of the Mechanical Cultivation Scheme took place and a great deal of experience was gained with the best methods and machinery from the various field experiments which were carried out.

27. The number of sites was again increased—without haste and depending on the accessibility, interest of the farmers and availability of machinery. One previous site in the Scarcies (Mange) was abandoned due to the fact that farmers thought they could get land cultivated without paying anything for it. Elsewhere the idea of paying for work done is becoming firmly established and accepted. The standard charge of £3 an acre for ploughing and harrowing continued and a target of 4,000 acres was set and 3,957 acres actually cultivated, against 2,097 in 1952. Considering the problems involved in erecting new machinery, moving it, general organization with a staff shortage and the training of mechanics and drivers, expansion can be said to be very satisfactory and reflects great credit upon the field staff. The policy of feeling our way, experimenting on sites, evolving organizations and technique to suit conditions and keeping overheads to a minimum continued. Expansion will be continued on the same lines in 1954 although it will be necessary to start construction of several permanent workshops at central points to cope with repairs and the storage of spares.

28. In general yields were very good in 1953; there was little flood damage in any area and the farmers were very satisfied and co-operated very well. Early planting is one of the keys to a successful crop and the point is at last being taken to heart by the farmers as, almost without exception, any poor crops were due to late planting. It is clear that the Bonthe-Pujehun grasslands, although they set a problem over grass clearing, are much more fertile than the Boli lands, giving average yields of 1,500–1,800 lb. per acre of paddy. The Boli lands, however, with superphosphates, give reasonable yields in the region of 1,200 lb., and even without superphosphates give higher yields than those obtained on the uplands in the areas concerned.

29. This year saw a large number of experiments with new machinery—polydiscs combine drills, grasscutters, Goble disc harrows, rotary cultivators and Cuthbertson half-tracks. Many of these will have a place in the cultivation operations on certain types of land, particularly combine drills in the Bolis and Goble disc harrows in the Bonthe area. The latter were tested during the year and found to be the solution to the clearing of heavy grass: set at a wide angle they cut or bruise the bulk of the grass which can be burnt after it has been left to dry thoroughly. Field experiments were also expanded, especially those concerning varieties, optimum planting dates and fertiliser.

30. Whilst some difficulties are inevitable the prospects are excellent. The economics of the whole scheme will have to be carefully and regularly considered but the value to the country of such a scheme, which is rapidly developing previously unused land, must be considered in relation to the capital expenditure. Further rapid expansion is essential if the country is to produce sufficient rice for its needs, as, with the increased population, the movement of population to industry and the overcropping of the uplands under the traditional systems, the subsistence farmer who in the past has supplied the staple food will very shortly be unable and unwilling to do so.

(*v*) *Swamp Seed Rice Distribution.*

31. Rokupr farm continued to be the main source of pure seed and produced 446 bushels (26,760lbs.). This was sold to farmers and used for supplying other stations. Some 30 tons of seed rice were produced on stations, sub-stations and Native Administration farms, and sold to farmers.

(*vi*) *Better Cultivation of Inland Swamps for Crops other than Rice in the Dry Season and the Development of Small Field Crops.*

32. The presence of a Horticulturist in Freetown has led to an increase in vegetable production in the area. He is constantly aiding farmers with technical advice and organizing sales of fresh vegetables, suitable vegetable seeds and fertilisers. Experiments were initiated with groundnuts on waste *Lophira* bush areas in Port Loko District with, so far, inconclusive results. If groundnuts or other crops can be grown in these areas a further large area of little used land will be available for productive cultivation.

33. The increase of dry season cultivation of sweet potatoes, cassava and vegetables on inland swamps continued to be encouraged, and this practice has spread and become much more general in recent years.

34. Banana growing continued to increase but its future depends mainly on the organization of storage, regular shipping and the delivery by the farmers of good quality bunches in the right condition. If this trade can be firmly established there is a good chance of establishing a fresh pineapple export trade using the same transport.

(*vii*) *Improvement of Livestock and Poultry.*

35. *Cattle.*—Now that Musaia Livestock Station is established the cattle breeding policy was revised. It was decided to discontinue selection for milk and to concentrate on breeding for beef. The aim is to breed Ndama Cattle under natural conditions, which will reach a greater weight at an earlier age than the local cattle and to improve the regularity of breeding. These improvements will give better beef animals, more economic production of meat, a nucleus of improved animals for use in local herds and production of strains which calve every twelve months. Recording of weight for age will continue and a standard for culling was laid down. Later, when outstanding bulls have been selected, line breeding will be intensified.

36. Surveys in the Musaia area continued and 17 square-mile areas were delineated for the settlement of cattle owners. Arrangements were made for funds to start the improvement of these areas early in 1954.

37. *Pigs.*—The work on pigs was intensified at Newton, Njala and Musaia. At Newton and Njala new piggeries were erected and at all stations the stock increased. Ninety-one pigs were sold to local farmers for breeding purposes. A boar stud was started at Newton for the use of local pigkeepers. The main problems are trypanosomiasis and adequate supplies of local foodstuffs. The use of antrycide has kept losses from trypanosomiasis to 5 per cent. Costings of the Newton piggery have shown that pig rearing is profitable despite these losses.

38. *Small Livestock.*—Rabbits and guinea pigs have continued to do well. Fifty rabbits were supplied to the Veterinary Department for the production of Rinderpest Vaccine and thirty-one sold to local applicants.

39. *Poultry.*—Two hundred day-old Rhode Island Red chicks were imported by air from the United Kingdom and stocks were considerably increased on all stations. Distribution to local farmers increased to 140 cocks, 60 hens and pullets, 1,326 six-week old chicks and 6,456 hatching eggs, mainly from Newton. These did not satisfy the demand and further expansion has been arranged and extra incubators ordered.

40. *Chinese Geese.*—A further 50 ten-week old Chinese Geese were imported. These are doing well at Newton, Njala and Musaia. The main problem has been the percentage hatchability of the eggs. Eggs must be set very quickly, within a few days of laying, as the fertility rapidly decreases.

41. *Ducks.*—There was a general expansion in the stock of local Muscovy ducks, which on all stations have proved the most successful.

B—The Cultivation of Cash Crops and the Exploitation of Wild Trees for Export Purposes.

42. The following table gives comparative figures of Agricultural Exports in recent years:—

Products	1938	1950	1951	1952	1953
PALM KERNELS					
Quantity	63,697	71,269	75,102	76,375	68,904
Value	£454,031	£2,277,752	£4,549,773	£4,675,941	£4,259,539
Price	£7	£32	£61	£61	£61
PALM OIL					
Quantity	1,066	1,940	3,191	832	362
Value	£16,025	£105,411	£260,844	£87,940	£26,873
Price	£15	£54	£81	£105	£74
PIASSAVA					
Quantity	3,791	5,348	6,153	3,546	2,646
Value	£40,369	£273,336	£283,010	£138,671	£192,452
Price	£10	£51	£46	£39	£72
GINGER					
Quantity	2,705	2,383	3,251	1,515	1,859
Value	£60,680	£563,535	£772,388	£169,629	£144,702
Price	£22	£237	£241	£111	£77
COFFEE					
Quantity	38	317	1	1	1,050
Value	£793	£39,092	£216	£217	£333,014
Price	£21	£123	£216	£217	£317
COCOA					
Quantity	384	1,620	1,118	2,061	1,631
Value	£5,849	£117,212	£525,974	£638,418	452,923
Price	£15	£72	£290	£309	£270
KOLA					
Quantity	1,450	1,070	1,564	1,242	1,204
Value	£29,785	£106,244	£181,974	£181,009	£136,385
Price	£20	£99	£116	£145	£113
BENNISEED					
Quantity	374	804	46	336	636
Value	£3,700	£33,811	3,073	£30,995	45,666
Price	£10	£42	£67	£92	£71
GROUNDNUTS					
Quantity	Nil	3,465	3,619	2,168	2,686
Value	—	£100,011	£189,414	£182,322	£153,000
Price	—	£29	£52	£84	£56
Total Tonnage					
All Exports	73,505	88,215	94,738	88,076	80,978
Total Value					
All Exports	£614,232	£3,616,404	£6,766,666	£6,105,178	£5,714,554

NOTE:—Quantities are quoted in tons. Prices are the average ruling price per ton during each year. These figures are quoted from export statistics, the actual monetary value to the producer would be two-thirds of these figures.

43. The main changes in production were decreases in palm kernels, palm oil, piassava and cacao and increases in ginger, coffee, beniseed and groundnuts. The decrease in palm kernels is not surprising when the work involved is considered, and with more children going to school and a decrease in the farming population this export is the first to be affected. Mechanical means of nutcracking appear to be a possible method of checking this decline. Cacao decreased as it was a poor year for this crop, and palm oil apart from the drop in price is being more heavily consumed in the country. The increase in coffee exports was largely due to the price, as in 1951/2 most was sold in adjacent territories at a higher than local price. Also many of the trees planted in recent years have started bearing.

44. In addition to encouraging cacao and coffee planting the Department continued to encourage improved oil-palm planting throughout the country. The oil-palm campaign started in 1948 and progress is shown in the following table:—

OIL–PALM DISTRIBUTION

Number of Seedlings Distributed:

	1948	1949	1950	1951	1952	1953
Njala ..	—	2,230	6,277	4,716	16,738	15,644
S.W.C. ..	1,212	4,000	8,604	21,600	50,565	62,215
Rokupr ..	75	2,814	783	3,115	9,629	600
Port Loko ..	833	5,255	7,775	12,118	5,772	3,523
Makeni ..	3,630	4,455	12,053	25,675	43,396	48,744
Kenema ..	3,000	874	—	1,190	4,900	11,515
Colony ..	—	300	4,000	12,600	14,500	3,300
Bonthe ..	—	—	—	—	615	2,790
Total ..	8,750	19,928	39,492	81,014	146,115	148,331

45. Survival rate has been very variable but averages about 40–50 per cent. Unfortunately many of the farmers only care for the young palms during their first year and thereafter allow the natural vegetation to grow up and swamp them instead of intercropping, which is the established and essential practice. In addition, unless intercropping is carried out attacks by rodents become excessive and there is a higher probability of loss due to fire. It would seem that a mixed plantation of oil-palms interplanted with cacao and coffee may provide the ultimate economic solution, attractive to farmers. Trials in this direction are to be instituted.

46. The main oil-palm station continued to be at Njala and a further 100,000 seeds of improved varieties were obtained from the West African Institute for Oil-Palm Research, Nigeria. The overhead irrigation system has been very successful in reducing labour costs and increasing the efficiency of watering. Other nurseries were maintained at all stations and by most District Councils.

47. Owing to the high price, large numbers of farmers planted coffee rather than cacao. Cacao cultivation, however, continued satisfactorily. The major problems are "black pod" disease and damage by monkeys. Propaganda on methods to reduce "black pod" have had little effect amongst the farmers, who prefer to blame all losses on monkeys. In the South-western Province further monkey drives were organised and some 12,000 monkeys killed, bringing the total up to 115,700 killed in the South-western and South-eastern Provinces since 1947. This has certainly had an appreciable effect, as most of these were killed near plantations and villages.

48. The cacao fermentaries ceased operating for general farmers' use as a number of Co-operative Cacao Marketing Societies were established which took over their functions. Only three fermentaries were operated, one in Kenema District and two in Pujehun District, for experimental work, and the Produce Marketing Board provided funds for these. Advice on the best methods of fermenting was continued to farmers and Co-operative Societies and resulted in a larger quantity of Grade I Cacao being produced. The seedlings raised from the seed of selected Amazon cacao trees imported from the Gold Coast in 1952 were planted out in various areas in the South-western and South-eastern Provinces for observation.

C—Soil Conservation.

49. The expansion in the development of inland, saline and mangrove swamps and in mechanical cultivation of riverain grasslands and Boli lands has been actively continued thus providing some relief to the pressure of farming on the uplands.

50. Early burning of grasslands, particularly in the northern savannah areas, continued this year on an extensive scale. This is organised by the Forestry Department, and carried out by Forestry, Agricultural, Administration and Native Administration staff. This practice ensures that any late fires are not damaging to tree species and thus encourages regeneration.

51. The surveys in the area north of Kabala continued, and the establishment of dams to hold water for cattle in the dry season and to extend the areas suitable for rice and pasture was accepted as being an integral part of the new scheme to settle nomadic cattle owners, mainly Fulas. Seventeen areas were delineated and funds arranged for the establishment of dams and the improvement of the areas generally. Plans were also submitted for the appointment of a hydrologist as large areas require early attention to prevent the insidious deafforestation and erosion which is taking place.

D—The Improvement in Preparation, Quality and Marketing of Produce.

52. Instruction continued to producers in the proper methods of preparation of cacao, piassava and other produce. The work of the original cacao fermentaries has been very successful and has led to a considerable and increasing number of Cacao Co-operative Marketing Societies, all of which have followed the departmental advice on fermenting, and which are producing high-grade cacao. Departmental cacao fermentaries were reduced to three, all of which were used for experimental work. Propaganda and instruction amongst piassava producers continued, but it is difficult to get lasting results as many producers prefer to produce large quantities at a low price rather than smaller quantities at a much higher price. The attitude of middlemen is also to blame, particularly the system of giving advances for piassava which leads to producers sending in any rubbish they can get away with. The increasing number of Co-operative Piassava Marketing Societies is encouraging higher quality produce, especially in the Bonthe District.

E—Agricultural Education.

53. The training of future Agricultural Instructors continued at the Njala Training College. There were thirty-seven students in training, of which nine completed the course and were posted as Agricultural Instructors. Ten completed the second year and eighteen were recruited and started their first year. Visits were made by final year students to Musaia Livestock Station, the Veterinary Department Teko and mechanical cultivation sites at Makeni, and by second year students to cacao areas in Kenema and Pujehun Districts.

54. Mr. W. C. O. Allen, an Agricultural Instructor, returned to the Department from secondment to the Mabang Agricultural Academy in September.

55. Students taking training courses overseas for possible appointment to the Department included S. A. Kawa, Degree course in Agriculture, Wye; A. R. Siaffá, Degree course in Rural Science, Aberystwyth and H. O. Jarret, Honours Degree in Agricultural Chemistry, Glasgow. Mr. C. T. Pyne obtained an Honours Degree in Botany at Cardiff and proceeded to Cambridge to do a post-graduate course. Mr. J. O. Belford failed in his course and resigned from the Department. Two instructors, Messrs. P. V. Sellu and A. Koroma, proceeded to the Nottinghamshire Farm Institute for a year's course in general agriculture.

56. Mr. W. Jackson, Botanist, Rice Research Station, visited Nigeria from June to September to attend a course in Agricultural Statistics.

F—Research.

57. The erection of the West African Regional Rice Research Station at Rokupr continued apace, and the main laboratory and office buildings were completed, except for fittings, by the close of the year. A power station was erected, also one new Senior Service quarter, two new Junior Service quarters and a field laboratory for the Botanist. Details of the experimental work are given in the Annual Report of the Rice Research Station, published seperately.

58. Further discussions took place regarding the establishment of an oil-palm research sub-station in Sierra Leone and arrangements were made for work to start in 1954 and for a research officer to be seconded to take charge.

59. The Plant Pathologist continued his fundamental work on Sierra Leone fungi and investigating plant diseases. Details will be found under the appropriate section.

60. The Agricultural Chemist continued fertiliser experiments on rice and groundnuts and undertook trace element experiments with groundnuts as well as carrying out routine analyses of soils. Details will be found under the appropriate section.

SECTION II—THE WORK OF THE DEPARTMENT OF AGRICULTURE

A—Organisation and Staff

61. Organisation remained substantially as in 1952 except that Port Loko Circle was finally established as a distinct circle consisting of Port Loko District, which previously had come in the Scarcies Circle. The need for a permanent officer in this district had been apparent for some time.

62. There were no retirements amongst the Senior Staff and only one transfer, that of Mr. J. E. O. Jones, Secretary, to the Colonial Secretary's Office in July. Mr. J. H. Roberts, Head Clerk, acted in the post for the remainder of the year.

63. Dr. T. E. Tomlinson, newly appointed Chemist, Rice Research Station, arrived in April after a period on secondment to Rothamsted Experimental Station.

B—Agricultural Circles

South-western Circle

Experimental Station, Njala.

64. *Upland Grasses.*—The planting of exotic grasses for pasture and fodder purposes and as a fallow crop continued. Maintenance of the dwarf strains of *Panicum maximum* continued to be very difficult and it is clear that under local conditions weeds and indigenous grasses would quickly eliminate them unless they were carefully weeded. The grass *Pennisetum setosum* ex-Gambia and the indigenous strain ex-Makali; *Panicum maximum* CPI 8389 and dwarf strains ex-Queensland and ex-Puerto Rico have all been shown to be excellent fodder crops. In general records over the last five years have shown that high yields are only given in the second, third and fourth years, after which yields drop off quickly unless very considerable maintenance is done and heavy fertiliser dressings applied, even on the plots on which cows are grazed only.

65. A fertiliser trial on all varieties indicated that *Pennisetum setosum* ex-Makali gives by far the best response to all types of fertiliser and by far the greatest yields, with *Pennisetum setosum* ex-Gambia second.

66. *Pennisetum setosum Blocks.*—Results from the blocks of the two varieties ex-Gambia and ex-Makali planted in 1947 indicated that the yields have levelled out. The sward on both the grazed and cut plots, despite maintenance, has become poor, and it appears that swards of this type have a life of only about five years. No fertiliser was applied in 1953.

Yields,—Pounds/Acre	*Makali Strain*	*Gambia Strain*
Cut 1951	27,984	29,225
Cut 1952	22,044	26,828
Cut 1953	7,824	7,928

Cow Days/Acre	*Makali Strain*	*Gambia Strain*
1951	228	96
1952	550	276
1953	468	468

67. The block of one acre sown with upland rice in 1952 to test the effect of long grass leys on the fertility of the soil was planted for a second time. The yield in 1953 was 537 lb. against 240 lb. in 1952, indicating that the second year's crop under such conditions is better than the first.

68. *Tephrosia candida.*—Upland rice was grown for a second time on the area which had been under *Tephrosia candida* for three years. Fertiliser treatments were as in 1952 but one-half of each of the four plots was top dressed with 2 cwts./acre of sulphate of ammonia just before flowering. Yields were:—

Control	576 lb./acre paddy
Control and top dressing ..	592 „ „ „
Nitrogen	384 „ „ „
Nitrogen and top dressing ..	456 „ „ „
Superphosphate	640 „ „ „
Superphosphate and top dressing ..	800 „ „ „
Potash	568 „ „ „
Potash and top dressing	424 „ „ „

The application of superphosphate appears to maintain yields better than any other straight fertiliser as has been shown in other experiments.

69. *Leguminous Fodders.—Pueraria phaseoloides* continues to be the most satisfactory, its only drawback being the difficulty of eradicating it in succeeding years. Various local beans and cowpeas grow satisfactorily but do not smother the weeds. *Stylosanthes gracilis* ex-Nigeria was planted on a small plot and is promising. It is to be multiplied and tested on a field scale.

70. *Other Annual Crops.*—New fertiliser trials were laid down on various crops. Results confirm previous years' experiments that crops generally respond well to phosphatic fertilisers on the upland soils at Njala and that the maximum response is at about 2 cwts. of superphosphate per acre. Early planting of groundnuts, immediately the rains start, seems essential for a good crop although other factors are also important. Early planting invariably reduces the incidence of various diseases. Fertiliser demonstration plots were continued and several hundred farmers visited Njala to see them. Many applied for fertilisers for their own use.

71. A groundnut trial to compare the effects on yield of planting decorticated and undecorticated seed showed that although the undecorticated seed takes about a week longer to germinate, final results are not significantly different. There is a considerable saving in labour by this method and fewer replacements are required.

72. A further trial to see if there are any differences between deep and shallow cultivation for groundnuts again showed no significant results.

73. The groundnut exhaustion trial continued. This is basically to see the effect on yields from continued cropping. Results to date are:—

Year	*Dry Wt./Acre (Undecorticated)*
1951	974 lb.
1952	512 „
1953	711 „

74. A trial to determine the best time to plant ginger clearly indicated early May.

75. Intercropping of young citrus orchards was extended especially with yams, pineapples, groundnuts and beans. This practice appears to be beneficial to the citrus and demonstrates intensive cultivation.

76. *Continuous Cultivation of Annual Crops.*—Many rotations have been tried in the past including long grass fallows and leguminous cover crops which have been singularly disappointing. Accordingly in 1952 it was decided to treat a one-acre block drastically basing treatment on deep cultivation in the dry season. This

block which is stony laterite soil had been under continuous cultivation since 1935, its fertility was very low and it was felt nothing could make it worse. The block was deep-ridged by hand into 4-feet ridges with ties every 12 feet. Previously, as far as can be ascertained, this block had never had deep cultivation. At planting time yams receiving a placement of mixed fertilisers were planted on the ridges. At the first heavy rains upland rice was scattered in the furrows and late in the rains, after harvesting the rice, cowpeas were interplanted halfway up the ridges. Vacant spaces and plot boundaries were planted with cassava. Yields of all crops in 1952 were so promising that it was decided to carry on the experiment for five years, splitting the ridges each year and repeating the treatment but adding superphosphates to the rice, beans and cassava. In 1953 yields were even better than in 1952. Local farmers have been most impressed by the demonstration. It appears to them as an adaptation of their own mixed cropping. It is a natural anti-erosion system, simple, with no complicated rotation, which can easily be followed by a farmer. Deep cultivation and the use of fertilisers are the only innovations. Yields from the block of mixed crops will be calculated in total calories of food. So far the experiment is most promising but it will need another three years to confirm results. The system certainly appears to have gone further at Njala, on a stony laterite of low fertility, than any other system. Variations on the same theme are to be extended to other blocks on the station and elsewhere, introducing mechanization, other crops, etc.

77. *Permanent Crops.*—Recording the yields of citrus, coffee and kola continued. A trace element experiment was initiated on a block of citrus. Observations have indicated that coffee can easily be overshaded with depressing effect on yields. Trees near the edges of the plots produced much greater yields than those inside. Radial manuring of kola continued to show good effects.

78. *Oil Palms.*—A further consignment of 100,000 seeds of improved varieties was obtained from the West African Institute for Oil-Palm Research, Benin, Nigeria. Germination was much slower than in the previous year. Maintenance of the present improved block of oil palms continued, and these will be taken over by West African Institute for Oil-Palm Research sub-station which it is proposed to establish in 1954.

79. The overhead irrigation system continued to be a great boon, cutting watering costs and ensuring more efficient watering of both oil palms and other seedlings. 15,644 seedlings of improved oil palms were distributed to farmers and 4,871 economic trees and ornamental plants. Most of the work of raising economic trees and ornamentals for sale was transferred to the Horticulturist's section during the year.

80. *Livestock—Cattle.*—The health and condition of the herd remained good throughout the year. One bull died through eating a poisonous shrub. The herd was inoculated against rinderpest. The average weight of new born calves continued to rise, and was 38.0 lb. compared with 36.3 lb. in 1952 and 32.7 lb. for the previous five years.

81. *Pigs.*—One new piggery was completed during the year. Culling of the undesirable strains was completed and the herd is now Large White and Wessex Saddleback only, with some first crosses. The herd increased from fifteen to forty-five and should shortly be double this when the building of a second piggery has been completed. Eight pigs were sold to local farmers for breeding purpose. One sick pig was slaughtered and was found to have an unknown kidney disease.

82. *Poultry.*—An outbreak of fowl pox caused the death of most of the young pullets. The flock was inoculated against fowl pox. At the end of the year the flock had increased to 104 adults and 149 chicks. Twenty pure bred Rhode Island Red pullets and four cockerels were received from the United Kingdom, and some chicks from Newton. The poultry position at Njala is still not as satisfactory as is wished, mainly due to disease and chick mortality. Egg production was 3,316, of which 1,397 were incubated and 646 sold to applicants for hatching. In 1954 it is proposed to modernise and expand the poultry section, the first aim being the establishment of 1,000 head of breeding stock.

83. *Ducks and Geese.*—The duck flock increased from 40 in 1952 to 109. They have done well and require little attention. Seventeen were sold for breeding. Main losses are due to coccidiosis in the ducklings during the wet season. Eleven Chinese Geese and one gander were obtained from Newton during the year. They have done very well and the main problem is low egg fertility, which is probably largely due to keeping eggs for too long before setting. Fertility of eggs appears to decrease rapidly after two or three days.

84. *Rabbits.*—These continued to flourish and the stock was forty-seven at the end of the year. During the year 26 were sent to the Veterinary Department for the production of lapinised rinderpest vaccine and 28 sold to local applicants for breeding. There is a good local demand. The only deaths were amongst the very young.

Extension Work:

85. *Inland Swamp Development.*—There was during the year a considerable increase in the area of swamp land cultivated in Bo and Pujehun districts. This was brought about by the very poor burning on upland farms due to early rains. Towards the end of May a number of upland farms in Pujehun District and part of Bo District had been abandoned and there was increased activity on swamp clearing and transplanting of short duration varieties up to the end of August. Swamp cultivation in the Moyamba District was normal.

86. The acreages cultivated in the Circle were as follows and are compared with previous years' figures:—

	Year	*No. of Farmers*	*Acreage*
PUJEHUN:	1949	2,089	2,557
	1950	2,188	2,677
	1951	2,188	2,677
	1952	2,188	985
	1953	2,245	1,235
BO:	1949	2,078	2,324
	1950	2,215	1,455
	1951	2,215	1,514
	1952	2,078	2,624
	1953	2,467	2,836
MOYAMBA:	1949	—	—
	1950	—	—
	1951	1,193	921
	1952	1,193	1,276
	1953	1,381	1,170

87. *Mangrove Clearance Scheme.*—This scheme, which is now operated by the District Council, was continued. Total acreage of new clearing amounted to 212 acres, 98 acres by assisted farmers and 114 acres by farmers not assisted by loans. The total area of new planting amounted to 156 acres. Considerable new acreages have been cleared along the Bumpe and Ribbi rivers and it is noteworthy that farmers are now extending along the small lateral creeks. Most of the clearing is being done by farmers who are unassisted by loans.

88. The Bumpe Native Administration Scheme has been very successful. The cleared area amounting to 35 acres has all been let out to farmers and planted this year. Growth of rice on the whole area has been good.

89. *Mechanical Cultivation.*—The Mechanical Cultivation Scheme was continued in 1953 and was extended to three new sites. The sites are now at Gbundapi, in Panga–Kabonde Chiefdom; Saama, in the Kemo–Pukumu Krim Chiefdom; Njalunda, in Mano Sakrim Chiefdom; Sulima in Soro–Gbema Chiefdom of Pujehun District and at Marthyn in the Moyamba District. Results of the scheme in 1953 were very good, rice yields in the Pujehun sites being heavy. This to a very large extent mitigated the losses to farmers in 1952 caused by severe flooding of the areas. The Marthyn Scheme in Moyamba District was not quite as successful as it

might have been due to various adverse factors, the most serious of which were inaccessibility to the area and constant breakdown of the tractors. It has now been decided not to continue in this area until communications have been improved. The scheme at Sulima was a trial area and consequent on its success this year will be extended in 1954.

90. Harrowing was continued in 1953 at all sites and farmers were very quick to take advantage of the offer to harrow their land after sowing, for this service they paid an additional ten shillings per acre.

91. The following is a table showing the progress of the scheme from 1951 to date:—

Site	*Acres Ploughed* 1951	1952	1953
PUJEHUN DISTRICT:			
Sulima	—	—	25
Gbundapi	32	403	321
Saama	—	—	170
Njalunda	—	—	107
MOYAMBA DISTRICT:			
Marthyn	—	316	395
	32	719	1,018

92. In addition to the ploughing done for the local farmers, investigations were made on time of planting, suitability of various varieties of rice and reaction of crops to dressings of superphosphate. These investigations will assist in deciding on the most suitable varieties for each area and the most suitable time for planting, thereby reducing the risk of losses due to heavy flooding or other abnormal conditions.

93. Observations were kept at each site on the growth of weeds and their recurrence after ploughing. Partial control of the most common and most troublesome weed, nut grass (*Cyperus rotundus*) was obtained by late harrowing. This weed, which becomes dormant after flooding starts, nevertheless competes with the young growing rice and very late harrowing destroys it, flooding then preventing its re-growth. The incidence of wild rice, *Oryza barthii*, was not common in the areas.

93A. The Pujehun and Moyamba District Councils continued to undertake payment for the cost of the scheme and to recover ploughing and harrowing fees from the individual farmers. Provision for the 1954 scheme has been made in the estimates.

94. *Seed Rice Production.*—The Niawalenga and Selenga Native Administrations gave loans for the establishment of seed rice farms. Pure Sughandi and D 99 were grown and the bulk of the seed produced was distributed in the two chiefdoms concerned. Twenty bushels were supplied to the Paramount Chief of Komboya Chiefdom, thirty bushels to the Bo District Council for re-sale to farmers participating in the swamp clearance schemes and twenty bushels to farmers in the Mechanical Cultivation Scheme, Sulima. The work is being continued in 1954. A Native Administration Seed Rice Farm was made at Njala–Komboya and very successful yields were reported. This rice is being distributed in the chiefdom for planting in 1954.

95. *Cacao.*—During 1953 very great improvements were made in production and quality of cacao. The crop has suffered to some extent by the increasing interest shown in coffee production, and new planting was on a smaller scale than in previous years. A survey of existing and new plantations gave the following results in acres:—

District	*Acreage* 1950	1951	1952	1953	*Increase*
Bo	1,002	1,335	2,006	2,173	167
Pujehun	2,533	2,883	3,303	4,423	1,120
Moyamba	—	54	71	95	24
Total	3,535	4,272	5,380	6,691	1,311

96. Two of the four cacao fermentaries were closed and the remaining two, one at Futa and one at Bumpe (Perri), were continued for experimentation on cacao fermentation methods. Previous work in these fermentaries had evolved a method for producing a high grade cacao. This method was printed and circulated to farmers and has resulted in a very considerable and general improvement in the quality of fermented cacao. Favourable comments on the quality of cacao generally have been received from the Produce Marketing Board and overseas buyers.

97. Work during 1953 was concentrated on further quality improvement and the elimination of bad flavours and aromas which have been the general complaint of manufacturers in the past. In order to do this, experiments were carried out as follows:—

(i) Fermenting for four, five and six days
(ii) Drying each fermented lot in the following ways
  (*a*) Shade drying for one day in thick layers
  (*b*) Shade drying for two days in thick layers
  (*c*) Shade drying for three days in thick layers
  (*d*) Immediate sun drying in thick layers
  (*e*) Immediate sun drying in thin layers.

As far as fermented lots would allow, baskets were divided into five parts for drying as above. This, however, had to be modified for some of the smaller parcels of cacao. Shade drying on thin layers was tried in the case of two fermented lots. The scope of the work was limited by the relatively small quantities of cacao handled.

98. Samples of dried cacao from each experiment have been sent to two manufacturers in the United Kingdom and one in the United States of America. Reports from these manufacturers have been very favourable and indicate that work is progressing along the right lines, the text of one of the reports being as follows:

> " . . . . . have examined the above samples and we consider that these set a standard which the Gold Coast and Nigeria should attempt to match. . . . There is no slate whatsoever and the general degree of fermentation is as good as the upper standard of Gold Coast before the last war . . . . . "

In view of the fact that Sierra Leone cacao has in the past been used by manufacturers for cacao butter extraction only, such a report indicates that good progress is being made.

99. *Cacao Manurial Trial.*—The manurial trial was continued at Futa. It was noted that application of superphosphate showed an increase of 115 per cent in weight of cacao, an increase of 100 per cent in the number of pods per tree and a slight increase in the average weight of cacao per pod. Treatment with superphosphate and sulphate of potash showed an increase of 51 per cent in total weight of beans and the average weight of cacao per pod showed an increase of 100 per cent. The number of pods harvested was however lower. It would appear that application of superphosphate prevents to some extent attack by " black pod " disease while cherelle wilt is not as heavy on treated plots as on controls. Application of potash appears to have the effect of increasing pod size, but does not have any appreciable effect in reducing loss by " black pod " or cherelle wilt. These trials will be extended this year but there is difficulty in obtaining sufficient young trees for the experiments. The present trials are not satisfactory as little is known of the yields of the trees before the trials started and there are far too many uncontrolled factors to make the trials conclusive.

100. *Cacao Varieties.—Amazon Selection ex-Gold Coast.*—130 seedlings of the Amazon strains ex-Gold Coast were planted at Futa. Establishment and growth has been good and details are as follows:—

Variety	*No. of Plants*
T 60/1775x1051	50
T 85/779x876	48
T 12/27x26	32

Losses were limited to one T 85 and one T 12.

101. *Coffee.*—The interest shown in this crop has increased greatly and new plantations are very numerous. It is anticipated that the 3,000 acres of new plantings in 1952 will be exceeded by a considerable margin. In addition to this there has been considerable activity in bringing old plantations into use and very few plantations are now left unbrushed.

102. The quality of the dried coffee has given cause for some concern and while there is no difficulty at present in finding a market for all the coffee it is felt that unless quality improves, there will be difficulty in selling it when the demand falls. Accordingly attempts are being made to improve quality. This is being done by persuading farmers to allow their cherries to ripen, to dry them carefully and to prevent contamination with extraneous material. Some success has been met in producing cleaner coffee by the use of Gordon coffee hullers, which were used for the first time in Perri Chiefdom this year. Farmers were very keen to use this machine and willingly paid a fee of 1*d.* per pound. The use of these hullers will be extended in the next season, the District Council having provided funds for their operation and maintenance. It is hoped that with propaganda and the use of improved methods a higher quality coffee will be produced in the same way as cacao.

103. *Piassava.*—Towards the end of 1952 a proposal was made to withdraw the concession whereby traders were permitted to possess material containing 12½ per cent impurity instead of 5 per cent. This was put into effect on 1st January, 1953 and resulted immediately in a complete and effective boycott of piassava by all traders. Attempts were made to increase production and sales by Co-operative Societies but met with only a small measure of success. Complaints of the impossibility of producing a 5 per cent standard of cleanliness and of hardship resulting from the boycott were considered at a meeting of the Piassava Advisory Committee held in June. It was decided that all restrictions on up-country purchasing from producers should be removed, that examination and sealing for export would be made only in Freetown or Bonthe, and that a 7½ per cent and 12½ per cent impurity tolerance would be allowed for Prime Sherbro and Sulima grades respectively in traders hands; under which figure no prosecution would be made. The immediate result was a very large quantity of very poor material being marketed, which undoubtedly was old stock produced in the later months of 1952 and early 1953. Thereafter there was a steady improvement in quality, the onus having been placed fairly on the up-country buyers. Towards the end of the year up-country buyers were requesting that examination and sealing should be reintroduced as they were experiencing losses due to Freetown buyers and exporters refusing to purchase, or unduly lowering the price for sub-standard piassava. It is noteworthy that quality has improved after opportunities for bribery were removed.

104. *Oil Palms.*—There was a continued increase in output from oil-palm nurseries and an increased number of seedlings were distributed, as follows:—

	Seedlings in Nurseries	*Seedlings Distributed*
1949	10,000	4,000
1950	21,000	8,604
1951	140,800	26,332
1952	123,000	66,493
1953	235,883	74,391

105. Included in the figures distributed for 1953 are 12,176 seedlings sent to Newton for planting at Waterloo. Check counts indicate that survival rates of seedlings planted in the field are in the region of 55 per cent. Failures were caused by rodents, in particular " Cutting Grass " (*Thryonomys swinderianus*). The heaviest losses were experienced in Moyamba District, where in some areas survival rate was as low as 30 per cent. Seedling and seed distribution were continued from Masanki, a total of 181,000 Nigerian " A " seedlings being distributed to various nurseries throughout the country. In addition 56 bushels of Nigerian " A " seed were distributed to other stations.

106. *District Councils.*—Considerable time was spent during the year assisting District Councils in the implementation of their Development Plans, the preparation of estimates and plans for 1954 and in planning the new organisation which will come into effect in 1954. The following is a summary of work done in each district.

107. *Bo District.*—All departmental extension work was included in the plans and estimates of the District Council. This included oil-palm propagation and distribution, cacao and coffee extension work, inland swamp clearance schemes and livestock extension work. A proposal that chiefdom agricultural sub-committees should be formed was also accepted by the District Council. Oil-palm nurseries were maintained at Mandu, Bumpe, Gboyama and Jimmi Bagbo and in addition to nursing oil-palms, coffee and cacao seedlings were also established in the nurseries for distribution in 1954. Six Junior Agricultural Demonstrators were employed by the District Council and these remained in charge of the oil-palm nurseries working mainly on oil-palm extension work. They were assisted by the Native Administration Demonstrators of those chiefdoms in which they were appointed.

108. *Moyamba District Council.*—The Mechanical Cultivation Scheme was continued at Marthyn and a total of 400 acres ploughed and allocated to farmers. The District Council collected individual fees for the 1952 ploughing scheme and in addition paid for the cost of ploughing to Central Government. Oil-palm nurseries were maintained at Bradford, Rotifunk and Sembehun with a small nursery at Bumpe. Two District Council Agricultural Demonstrators were appointed and took charge of oil-palm nurseries at Bradford and Rotifunk. Advice on holding the Annual Agricultural Show was given and assistance given on its organisation.

109. *Pujehun District Council.*—Oil palm nurseries were maintained at Pujehun, Potoru and Zimmi and were supervised by District Council Junior Agricultural Demonstrators, who were also responsible for the oil-palm extension work. The District Council undertook financial responsibility for the mechanical cultivation schemes at Gbundapi, Saama, Njalunda and Sulima, collecting the fees from farmers and paying Central Government for the work done. Coffee and cacao development was also carried out.

Scarcies Circle

110. *The West African Regional Rice Research Station.*—The Rice Research Station, Rokupr, which has been in existence since 1934 as the centre for the Scarcies Circle and which has played a leading part in rice development in Sierra Leone, has now become the West African Regional Rice Research Station. In addition extension work is carried out from Rokupr in the surrounding districts. During the year constructional work on buildings and laboratories was completed and laboratory fitment begun. Water and electricity supplies were put into operation.

Extension Work:

111. *Swamp Clearance Schemes.*—The progress of the three main mangrove empoldering areas is as follows:—

Total Area Empoldered in Acres

Area	1949	1950	1951	1952	1953
Bakepet	10	105	205	205	205
Bambaia	—	—	130	130	130
Mapotolon	—	—	—	250	498
Total	10	105	335	585	833

These projects are now under District Council, with the Irrigation and Drainage branch of the Public Works Department being responsible for bunds and sluices. The first two sites were hand-empoldered, whilst Mapotolon was done by excavators. These schemes are still very much in the pilot stage and indications are that except in the Mapotolon coastal area, empoldering is hardly necessary providing drainage is adequate and is improved. The general rule seems that where bunds and sluices

can be avoided it is better to concentrate upon clearing and deepening natural drainage channels, leaving a free wash. In this connection it is of interest to note that the Luti and Rosino areas, relics of the ambitious wartime irrigation venture, are now producing good crops of rice as a result of free wash and improved drainage whereas when under bunding and water control no rice grew. It would seem that creek clearing will become standard practice and a beginning has been made at Maseba with £100 made available from Community Development Funds. In future years these clearing projects will be expanded.

112. *Mechanical Cultivation.*—Potential plough areas in this circle are in the grasslands near Mapotolon, at Kassassa in the north, at Mange and along the northern banks of the Little Scarcies. So far the tidal areas of the Great Scarcies do not offer themselves to mechanization. Trials have been made in all of these places except the inaccessible Kassassa area, with varying results, the chief obstacle being that with ample rice produced by hand on a large scale, farmers are not in immediate need of more rice. Whilst being quite willing to plant up all the lands mechanically cultivated they are not prepared to pay for this service. However, with labour becoming scarce and costs rising, it is possible that there will be a change of attitude in the near future.

113. *Seed Rice Production.*—Five Native Administration Farms are in existence producing some 8–9 tons of pure seed annually whilst Rokupr adds its regular quota. With the Rice Research Station getting into its stride it is to be expected that over the next few years the production and multiplication of pure seed, not only of the established favourites but of improved new importations, will be increased.

114. *Livestock.*—There is a noticeably awakened interest in cattle, pigs, sheep and goats in the Scarcies area. Two privately-owned piggeries are in existence whilst one Paramount Chief operates his cream separator very successfully in local butter production from his cattle herd. Expansion in these directions although comparatively slow would offer a welcome variety to the almost sole concentration upon rice in this area.

Port Loko Circle

115. *General.*—This Circle, established in 1952, is concerned with extension work, any experiments being laid down on extension sites and farmers own holdings. Its main work is mechanization of swamp rice production in the Little Scarcies area, the establishment and distribution of improved oil-palm seedlings, the development of the pig industry, the development of unused *Lophira* bush areas and the investigation into the use of fertilisers. The office and store were completed at Port Loko in the early part of the year, and a combined petrol and fertiliser store has been built, together with a garage for housing tractors and implements.

Extension Work:

116. *Mechanical Cultivation.—Swamp Rice.*—Mechanical cultivation in Port Loko Circle has progressed as follows:—

Site	1952	1953
Kasanko	453	196
Madina	—	202
Mange	—	156
Kikam	—	43
Konta	—	81
	453	678

Kikam and Konta were experimental sites in a new area and the rice planted on them failed, mainly due to the fact that they were the last sites ploughed, and the rice could not be sown early enough to compete with rising flood waters and weeds. At Madina good results were obtained by local people who harvested up to 1,500 lb./Acre Paddy, but strangers to the area had mediocre yields. All these sites are marginal on wastelands, for the most part uncultivated previously, and a cautious approach involving numerous trials is essential before expanding.

117. *Kasanko.*—Seed rice was combine-drilled with superphosphate at Kasanko, following successful results from the use of this fertiliser in 1952. The rate of application was approximately 1½ cwt. per acre, and though vegetative growth was very good yields were disappointing as there was a very high proportion of empty husks. It seems likely that the dressing of fertiliser was not sufficient on this soil, since heavier dressings on experimental plots gave better results. In 1952 the average yield was only 30 lb. of Paddy per acre. This year, with a dressing of 154 lb. of superphosphate per acre, it was 360 lb. per acre.

118. *Residual Effects of Superphosphates Trial, Kasanko.—*

Plot Nos.	1	2	3	4	5	6	7	8	9
Treatment lb./acre Superphosphate	C	132	C	222	C	341	C	440	C
1952 Yields of Paddy, lb./acre ..	61.6	303.3	27	706.5	33	798	34.5	1240	48
1953 Yields of Paddy, lb./acre ..	132.	232	91.5	352	127	712	140	837	150

The variety of rice used was Indo-China in 1952, and Toma 112 in 1953. This may account for the considerable increase in the control yields, but the residual effect of the higher dressings of fertiliser is very marked.

119. *Lime, Superphosphate and Triple Superphosphate Trial, Kasanko—*

Treatment	*Yield Paddy, lb./acre*
Superphosphate 184 lb./acre	910
Nil	64
Lime 184 lb./acre	130
Nil	64
Triple Superphosphate 184 lb./acre	1,175

Seed and fertiliser were sown together in strips 220 yards long and three drill widths across. The variety of rice was Toma 112. Lime appears to have little effect but the reaction to phosphate is marked.

120. *Residual Effects of Superphosphate Trial, Gbinty.*—At Gbinty, near the mouth of the Little Scarcies river, a rate of application and maintenance of fertility trial was laid down in 1952 using superphosphate. The same plots, each one-tenth of an acre, were planted with rice in 1953 to find if there were any residual effects. The results show that not only does superphosphate improve the yield, but it has a valuable residual effect:—

Superphosphate in cwts./acre	*Yield Paddy, lb./acre* 1952	1953
2	2,088	2,175
Nil	1,528	1,531
3	2,601	2,218
Nil	1,603	1,568
4	2,089	2,352
Nil	1,412	1,374

121. *Superphosphate and Triple Superphosphate Trial, Gbinty*—A simple trial to compare triple superphosphate with ordinary superphosphate indicated that the two fertilisers produced comparable result per unit of P_2O_5. Yields were as follows:—

Treatment	*Yield Paddy, lb./acre*
Nil	1,281
½ Cwt./Acre Triple Superphosphate	2,115
Nil	1,343
½ Cwt./Acre Superphosphate	1,798
Nil	1,407
1½ Cwt./Acre Superphosphate	2,192

It is considered that farmers in this area could increase the quantity of rice produced by 25 per cent to 50 per cent by the use of moderate dressings of superphosphate.

122. *Rate and Time of Application of Superphosphate.*—Forty small trials were located on swamp rice farms of local farmers in various parts of the Circle, to test the effect of rate and time of application of superphosphate. Individual plots were 10 ft. x 7 ft., from which an area 9 ft. x 6 ft. was harvested. The averages of all the results were as follows in lb./acre Paddy:—

Application of Superphosphate	*Number of Plots*	*Fertilised*	*Unfertilised*	*Per cent Increase Fertilisers over Control*
At time of planting	17	2,506	1,726	45.2
Three weeks after planting	10	2,123	1,646	28.9
Six weeks after planting	13	2,516	1,896	32.7
At ½ cwt. per acre	8	2,291	1,963	16.7
At 1 cwt. per acre	8	2,746	2,007	36.8
At 2 cwt. per acre	8	2,667	1,565	70.3

These results indicate that dressings of 1–2 cwts. of superphosphate at time of planting give the best results.

123. *Mechanical Cultivation of Groundnuts, Malal.*—The site of this project is situated in an area of *Lophira* bush, which is not suitable for traditional methods of cultivation. Some 53 acres were cleared in the latter part of 1952, following the successful cultivation of groundnuts on an area of seven acres in that year. The area was tractor-ploughed and disc-harrowed in the dry season, and all but two acres for experimental purposes were allocated to local farmers. There was some reluctance on the part of farmers to take plots, and planting was late in consequence. In spite of this they were well satisfied with the yields obtained. Fertiliser and variety trials were carried out with the following results:—

	Variety		
	Maris	*Kono*	*Temne*
1952 Fertilised	412	532	450
1952 Control	712.5	1,020	540
1953 Fertilised	112.5	105	345
1953 Control	127.5	150	180

The yields are given in lb./acre of undecorticated nuts, and the fertiliser dressing was a mixture of 105 lb. superphosphate, 105 lb. sulphate of ammonia and 75 lb. sulphate of potash per acre. The drop in yield in the second year is very striking but it must be remembered that the crop was planted late, and further trials are necessary before any final conclusions can be reached. This *Lophira* soil is not giving the expected reaction to fertilisers. In 1954 trace element experiments and trials with a variety of crops are planned.

123A. *District Council Oil Palm Planting.*—Nurseries were extended, and the number of palms available for future distribution was 53,000. Distribution so far has been:—

1951	12,118
1952	5,772
1953	3,523

124. *Piggery.*—The piggery established at Rosint last year has made good progress, and local butchers are keen to obtain animals for slaughter. There are now four gilts in pig, and one gilt and a boar have been transferred to a new piggery which has been built at Mahera.

125. *Mangrove Clearance Scheme.*—Two small Native Administration Schemes (now taken over by the District Council) in coastal mangrove areas of Kafu Bullom Chiefdom have resulted in a total of 176 acres being cleared, but with a fishing population predominating, the demand for plots is not great.

South-eastern Circle

Experimental Farm, Kenema:

126. *General.*—In view of the projected handover of this farm to the Kenema District Council on 1st January, 1954, the work was generally directed towards the simplified use to which it will be put under new management, *viz:* as a Central oil palm nursery for Kenema District and as a source of swamp rice seed for the District.

127. *Annual Crops.*—Work on the maintenance of inland swamp fertility was continued. Superphosphate had been applied on some of the plots, at low rates only, but there were no outstanding residual effects. Experiments were laid down on yams interplanted in the oil palm plot, to test the effect of time of planting as well as that of " capping " the seed yams with manure at time of planting. Results indicate that greater yields are obtained by " capping " with manure and that Chinese yams, at any rate, benefit by earlier planting.

Treatment	*Date Planted*	*Tubers Set*	*Date Harvest*	*Weight Harvest*	*Average Weight (lb.)*
Yam No. 152.					
Uncapped	26–3–53	30	7–1–54	23	0.76
Capped	26–3–53	30	7–1–54	68	2.26
Uncapped	26–4–53	63	7–1–54	104	1.65
Capped	26–4–53	63	7–1–54	153	2.42
Chinese Yams.					
Uncapped	26–3–53	73	14–1–54	150	2.05
Capped	26–3–53	73	14–1–54	260	3.56
Uncapped	26–4–53	95	15–1–54	120	1.26
Capped	26–4–53	95	15–1–54	160	1.67

128. *Perennial Crops.*—The established oil palms continued to make good growth and were utilised as a source of seed for the oil palm nursery. At the end of December, 1953, 35,406 seedlings were in the nursery. It is estimated that about 15,000 seedlings should be available from this nursery for planting out in the District in 1954. Owing to the restriction of size of plants in 1953 to 2′ 6″ or more before planting out only 2,195 plants were distributed from the farm this year.

129. *Livestock—Cattle.*—The small Ndama herd continued in fair health. An attack of rinderpest killed four animlas; the herd was inoculated and the remaining eleven have survived.

130. *Pigs.*—Health was satisfactory during the year but the number of breeding stock has been gradually reduced. No trypanosomiasis was suspected but the animals were given a precautionary injection of antrycide.

Extension Work:

131. *Swamp Clearance Scheme.*—The Giema farmers did not cultivate the whole of their swamp this year and no applications for superphosphate were received from them. In general, however, there appeared to be satisfactory cultivation of swamp rice within the Circle and some late upland farmers, who had had poor burns, turned to the swamps. A tendency to plant small patches of swamp rice late in the season was noted. These were mainly short duration rices and appeared to be an effort to extend the rice harvest season.

132. *Cacao.*—The establishment of new farms continues to decline, despite propaganda, farmers being attracted by the easier establishment, cultivation and preparation of coffee. No loans for cacao planting were given out by District Councils during the year but it is expected that some loans may be applied for early in 1954. No monkey drives were held during the year by either Kenema or Kailahun District Councils. Improvement has been noticed in plantation hygiene and propaganda continues towards eradication of " black pod."

133. A change in the method of fermentation of cacao was decided upon during the year with the object of reducing the proportion of " over-fermented " beans that became prevalent in the 1952–53 crop. This change appeared to be enthusiastically received by farmers, particularly as it reduced the number of days in fermenting baskets; it was not, at the beginning, at least, as carefully carried out as was hoped as farmers took some time to realise the need for adequate stirring of the fermenting beans and the changing of the baskets daily. Towards the end of the

season the quality offered for sale was much improved. Departmental fermentaries were reduced to one only, for experimental purposes.

Season	*Total Wet Cacao Purchased*
1950–51	11,448 lb.
1951–52	51,164 lb.
1952–53	30,253 lb.
1953–54	8,066 lb.

The decrease in quantity purchased was partly due to late starting of the fermentary owing to floods and partly to high prices offered farmers by middlemen for semi-fermented half-dried cacao. The season was rather earlier this year than in previous years.

134. One hundred and fifty-one seedlings of the Amazon type cacao were received from Njala during the year. These were planted out at two sites, *viz.* 17 in a shaded corner of Kenema Agricultural Station and 134 on an island in the Moa River situated near Konia in Dama Chiefdom. The following table shows the actual distribution:

Cross No.	*Kenema Agricultural Station*	*Konia Island*
T 85/799x876	4	44
T 60/1775x1051	5	54
T 12/27x26	5	30
T 65/203x202	3	6
	17	134

These seedlings were spaced 15 ft. x 15 ft. with a spacing of 21′ between the different cross numbers. They are making satisfactory growth.

135. One hundred and thirty-four seedlings of the Criollo type tree, surviving from the 1910 planting at Kenema, were planted out near the village of Konia, but not on the island, in July 1953. These were spaced 10′ x 10′. They are making satisfactory growth and the Paramount Chief of Dama Chiefdom has asked for further pods from the parent tree to raise more seedlings to extend this plot.

136. *Oil Palms.*—As it was found that scattered nurseries using the open sand-bed method were proving expensive to maintain and were not producing a satisfactory number of seedlings, steps were taken to concentrate germination at central nurseries in each district. If it is found advisable subsidiary nurseries will be established at suitable convenient points to be supplied with germinated seedlings from the central nurseries, and it is hoped that this will avoid the waste of seed that has undoubtedly occurred. The following seedlings were distributed for planting during the year:

Kenema	2,925
Kailahun	395
Kono	8,195

There were 70,054 seedlings in the various nurseries at the end of the year.

137. Efforts to get farmers to intercrop young plantations were continued during the year. These efforts have not met with much success however, paticularly where the plantations are being established on a communal basis. It is hoped to interest more individual farmers in making their own plantations as they will have more interest in fostering the growth of their own trees. In Kono, where two plantations are being established by the District Council, it has been decided to restrict the one at Worodu to approximately 50 acres for the present, until it is seen what response to appeals for inter-cropping is made. At Senehun, where the plantation was extended to approximately 70 acres with the help of mechanical cultivation this year, efforts are being made to encourage farmers to farm the ploughed land between the trees. Unfortunately by the time ploughing was really under way it was rather too late to plant upland crops, and those farmers who did have not had very good yields. Complaints are still being made about " Cutting Grass " (*Thryonomys swinderianus*) damaging crops. Inter-cropping on a large scale may reduce their activities; the use of improved " Sawyerr " rabbit traps gave only scanty protection.

138. Three Pioneer Oil Palm Mills have now been erected in Kenema District; two, at Baoma and Jagbwema (Simbaru), are working to capacity but the third, at Waanje river on the borders of Small Bo and Niama chiefdoms, has not yet been so successful. A tentative site for a mill in Kailahun District has been selected and awaits approval.

139. *Agricultural Shows.*—A successful show was held at Kenema for the fifth year in succession; the improved standard set at the previous year's show was maintained. A show was held in Kailahun District for the second year in succession; this time Pendembu was the venue. This show suffered from lack of local support.

140. *Coffee.*—Interest in coffee was maintained during the year and considerable new planting was done by farmers. This crop is more popular than cacao since it takes less trouble to maintain and prepare for market. Farmers are rather inclined to harvest and dry both ripe and unripe cherries at the same time although such practice can only produce an inferior quality. Some interest has recently been shown by individuals in coffee hulling machinery and, following demonstrations at the agricultural shows, by the Department of Commerce and Industry, two power-driven hullers have been sold in Kailahun District and a third has been sold in Kenema District.

Bonthe Circle

Extension Work:

141. *Mangrove Swamp Reclamation.*—The Mangrove Clearing Loan Scheme is being wound up. No new loans have been issued, but repayments will fall due for several years. During the year, £251 16*s.* 7*d.* was collected, leaving £260 13*s.* 4*d.* outstanding on the 31st of December. The scheme has been replaced by a District Council Scheme whereby land is cleared by direct labour and subsequently rented out to farmers for rice cultivation. During the year some 280 acres were felled by the District Council and 77 acres were felled by farmers themselves. The trend towards fewer farmers owning larger farms continued owing to migration of potential farmers to areas where employment for a regular wage is available. Yields on established farms continued to be good—from 1,200–1,500 lb. paddy per acre. Kiri-kiri grass (*Paspalum vaginatum*) continued to be troublesome, particularly on the established farms. Trials with hormone weed killers were carried out, both on this grass and on *Rhizophora* mangrove, but results were inconclusive and further trials are being laid down with a wider range of these chemicals at stronger concentrations.

142. *Mechanical Cultivation of the Riverain Grasslands.*—The erection of a rest house for the Agricultural Superintendent (Mechanical) at Solon and the workshop were completed, and a small office and generator room were added to the workshop. Two garages for tractors were erected, and full repair facilities are now available. This year ten tractors were available in the district, although three were not used due to shortage of spares. Progress since the start of the scheme is as follows:—

Year	*Acreage Cleared Mechanically*	*Acreage Ploughed*	*Acreage Harrowed*	*Notes*
1949	—	4	—	Trial with Anzani Horticultural Tractor.
1950	—	69	—	Half-track Fordson
1951	—	282	—	Full-track tractor
1952	—	465	318	Full-track tractors
1953	111	1,178	1,120	Full-track tractors

Tractors used were one Fowler Mark V.F. and six Fordson County tracklayers with T.V.O. or Perkins Diesel Engines. Ransomes Dragoon and Massey-Harris 504 disc ploughs were available, also Ransomes Countess disc harrows. Ploughing was divided between ten sites and a total of 1,178 acres ploughed and 1,120 acres harrowed.

143. The clearing of the heavy grass on sufficient land continued to be a problem and during this season hand-clearing on contract continued. However a series of trials with various types of machinery for this purpose were carried out. Bamford mowers and a Bomford hedgecutter were found to be unsatisfactory but Massey-Harris 6 ft. Goble disc harrows set at their maximum angles were found to be very

satisfactory as over 95 per cent of the heavy grass was cut, broken or badly bruised and, after leaving to dry, burned well. These discs were also found to be very satisfactory for harrowing after ploughing, especially on the sites with heavier soils

144. Other machinery tested for general use included a Fishleigh rotary cultivator, which was unsatisfactory as it clogged quickly if there was any rice straw or long grass left on the ground. A Ransomes polydisc was satisfactory for harrowing on the drier sites where it did not sink in, and a tractor bulldozer attachment was very useful in making landing places for pontoons—which are used in this district for moving tractors. A trial with a Massey-Harris 744D tractor on Cuthbertson half-tracks indicated that this worked almost as well as a tracklaying tractor in wet places and was slightly faster. The sinking in of the ploughs (with wheel extensions) seems to be the limiting factor to ploughing in many very wet places Trials with Cuthbertson half-tracks continue as it is not known how long they will last under such conditions.

145. Reclearing old farms, especially after a bad flood year when a lot of grass and weeds appear, is a problem but can be solved by using a Goble disc. Deep ploughing (10–12″) continued to control wild rice (*Oryza barthii*), the worst weed on the wetter sites. The rice beetle (*Heteronychus* sp.) caused no trouble as the old bunds of decaying weeds in which it bred, and which were common on native farms, have been ploughed in.

146. Rainfall and flooding were normal, and only 111 acres were damaged by floods. With further experience it will be possible to avoid any damage from normal flooding. Yields were good, averaging 1,500-1,800 lb. per acre, and yields of up to 2,200 lb. per acre were recorded.

147. Variety trials on selected strains of Indo-China rice and a local rice, Mbagboli, were continued, and over four years number 53 has given the highest average return. It is a strongly rooting strain, surviving the abnormal flood year 1952 better than the other varieties. Results have been as follows:—

Selection	Yields in Lb. Paddy per Acre 1950	1951	1952	1953	*Average*
Indo-China 19	870)	Discarded			
„ „ 20	870)				
„ „ 22	2,080	1,786	340)	1,656	1,466
„ „ 24	2,125	2,193	114)	1,440	1,468
„ „ 53	2,458	1,830	1,856	1,105	1,812
„ „ 62	1,770	1,267	750	1,368	1,289
„ „ 70	832	1,608	143	1,260	961
„ „ 81	1,217	1,167	443	660	872
Mbagboli (control)	1,059	1,629	328	888	976

148. Trials to determine the optimum time of planting were laid out on the Messima, Subu and Gandema sites. Indo-China 53 was used. No results were obtained from Messima owing to flood damage and weed growth. At Subu, which is a low site, results indicated that under the conditions of flooding for the year, which was average, the best time for planting was between mid-March and early April, although planting till the end of April was satisfactory. At Gandema, a high site, results indicated that the best time for planting was from mid-April to early May.

149. *Seed Rice Distribution.*—Sufficient seed rice was available and 218 bushels were sold to farmers. Distribution in recent years has been as follows:—

Year	1948	1949	1950	1951	1952	1953
Quantity in Bushels ..	38½	70	75	86	93½	218

150. *Piassava.*—Production was less than normal though quality was fairly good. Greater interest in the production of palm kernels and rice contributed to this decline. Co-operative Marketing Societies are becoming popular and there are now seven established.

151. Results from experiments carried out at the Piassava Experimental Station have indicated a further reason for the decline in interest by some farmers. It is evident that the yield of exportable fibre from a given quantity of raw material is much lower than normally thought. The yield from old mature palms was found to be about 120 lb. per acre and half of that figure from palms cut annually. The yields of fibre calculated from one ton of split stalks of each type of raw material were as follows:—

Material	*Pounds Fibre of 7½ per cent Impurity*
Sides, fronts and backs	71
Sides and fronts	91
Fronts	89
Sides	93
Backs less than	9

152. When one ton of mature split piassava stalks, fronts backs and sides, was processed, the yield of exportable fibre of 7½ per cent impurity was 59 lb. and in another instance 75 lb. The workers' time taken to produce piassava was divided between the various operations in the following proportions:—

Cutting and carrying stalks	28½ per cent
Splitting and retting	12 „
Hackling and cleaning	31½ „
Picking	28 „

It was clearly demonstrated that the production of piassava by direct labour at the Joint Industrial Council rates was quite uneconomic.

153. Retting trials indicated that a period of eighteen weeks is the minimum required to produce clean fibre free from pith.

154. *Coffee.*—Owing to high prices great interest was shown and a number of new plantations were established.

155. *Oil Palms.*—2,790 seedlings were distributed, compared with 615 last year. The total now distributed since 1949 in Bonthe Circle amounts to 6,039. No great interest in the improved varieties is being shown owing to the abundance of wild palms which are more than adequate to meet local needs.

156. Small power nut crackers were tried, with fair success, but they do not appear to be sufficiently robust to stand up to local conditions. Improved models are to be tried. Surveys of palm density were carried out with a view to finding a suitable site for a Pioneer Oil Mill.

157. *District Council.*—An Agricultural Instructor was loaned to the District Council to assist with the allocation of land on Mechanical Cultivation sites, the collection of fees, and with the supervision of oil palm nursery work, mangrove felling and Native Administration Agricultural Demonstrators.

158. The District Council felled, using direct labour, 280 acres of mangrove, bringing their total since 1952 up to some 400 acres.

Makeni Circle

159. *General.*—1953 was a period of transition . During the year arrangements were finalised whereby certain staff were to be transferred or assigned to local District Councils. District Council Agricultural Staff was reorganised and consolidated in work and efficiency. The bias of extension work by departmental staff swung away from routine distribution and supply matters towards concentration on the extension of mechanical cultivation schemes and closely related matters. During the planting season departmental staff acted in an advisory capacity towards both the farmers and the young and growing District Council Agricultural Staff alike; as well as maintaining observational control of mechanical cultivation schemes, fertilizer experiments etc. Makeni Station is now almost entirely concerned with extension work.

Extension Work:

160. *Inland Swamp Cultivation.*—Throughout the Circle generally inland swamp farming has taken tremendous steps forward in the last few years, and there can be no doubt that swamp development schemes have served a very useful and

instructive purpose. In 1952 there were eleven schemes, totalling 279 acres, demonstrating the clearance and development of inland swamps. The first of these schemes was initiated at Kamakwie in 1946. Now that the demonstration value of these schemes has been fulfilled and to release supervisory staff, all inland swamp development schemes, as such, were closed down by the end of 1953. All the swamps used were handed back to the landowners to farm themselves, or suitable tenant farmers were installed.

161. Almost all the more accessible and easier swamps have been exploited and, appreciating the cost and work involved in the initial clearance of the less accessible denser raphia swamps, Swamp Clearance Bonus Schemes have been started by the Department under the auspices of the respective District Councils. Under these schemes farmers can receive an outright grant or bonus of up to £5 per acre to assist and encourage them to clear and develop their own swamp land. Although in its infancy, the idea is popular and is catching on rapidly.

162. In conjunction with the bonus scheme to encourage clearance of swamps, the services of ox-ploughing teams—already started in 1953 by the Tonkolili District Council—also encourage more rapid and easier development of inland swamp farming generally.

163. The ox-ploughing farmers developing the riverain swamps along the Mabole Valley between Karina and Nafii continued to be assisted and encouraged throughout the year. There are now seventy-four of these farmers established, cultivating a total of some 500 acres.

164. *Mechanised Cultivation of Swamps.*—The following table shows the number of acres ploughed in the Circle in 1953 as compared with 1952:

Site	1952	1953
Bantoro (Sanda Chenraron)	238	417
Rochin (Sanda Chenraron)	—	190
Masima (Kholifa Mabang)	—	308
	238	915

165. The 1953 ploughing season was successful and satisfactory crops were obtained from all sites. The Boli land soils are typified by variable fertility and water regimes; this was confirmed in 1953. Successful rice farming of these soils depends on three cardinal features: use of phosphatic fertilisers, early planting and weeding of the young crop. Access roads are already opening up the Boli lands and there are no initial grass clearing problems—two important features in the extension of any mechanised cultivation scheme in these areas.

166. Trials with a combine fertiliser and seed drill at Bantoro have shown marked success and will be extended in 1954. At Bantoro drilling of seed has alleviated the weed problem and may in time obviate it. It is proposed to investigate this matter further in 1954 to confirm and establish data.

167. During 1953 surveys were continued to acquire more data regarding locality, accessibility, soil fertility and water regimes throughout the Boli lands. Most Bolis have been visited in the preliminary surveys carried out and the present surveys are to establish the detailed data necessary for and during the exploitation of these areas.

168. The response of local farmers is most encouraging and the demand for tractor ploughing far exceeds the present means of fulfilling those demands. At Masimo in 1953 farmers travelled from all the neighbouring chiefdoms with the hope of obtaining plots. Several were accommodated but many had to be disappointed and have to await the arrival of tractors in their own chiefdom Bolis. Mechanised cultivation of Boli lands is in its infancy, and an extremely vigorous, healthy and thriving infancy it is.

169. *Swamp Seed Rice Distribution.*—Makeni and Makali farms continued to produce seed rice throughout 1953. In the wet season some 10,000 lb. of seed rice (1952 harvest) was sold to farmers from these two farms. There are no Native

Administration seed farms remaining in the Circle, the last being closed down in 1952. Improved varieties of seed rice obtained from Rokupr and distributed to farmers on the ploughing sites will form a useful source of seed in future years. The local variety, Pakema, which has been so successful at Bantoro, was sent to Rukupr for trial and investigation.

170. *Cultivation of Inland Swamps for Crops other than Rice in the Dry Season.*—The cultivation of sweet potatoes, cassava, maize, groundnuts and local vegetables is now accepted practice in dry season swamp farming throughout the Circle. The people of Makeni town and the villages in the immediate vicinity continue to be the most notable exponents of this intensive dry season cropping. Market gardening is on the increase generally, especially in the vicinity of the larger towns such as Makeni, Magburaka and Makali. Assistance and advice has been given whenever possible and in particular to certain improved and progressive farmers.

171. The growth of pigeon pea as one of the most important of the minor crops within the Circle is worthy of note. The popularity of this crop is being utilized by the Department in its recommendation that oil palm plantations be established in mixed farms of pigeon pea, cassava, guinea corn, benniseed, etc., in which pigeon pea predominates.

172. *Livestock and Poultry.*—A certain number of Rhode Island Red fowls were distributed throughout the Circle. At present distribution is limited by the supply available from the livestock stations. No Rhode Island Red stock is reared for distribution at Makeni.

173. Muscovy ducks continue to do extremely well at Makeni, foraging in the fallowed swamp plots throughout the dry season. This breed is well adapted to local conditions and customs, thriving well with the minimum of attention.

174. During the latter part of 1953 a small piggery was constructed at Makeni for breeding and fattening purposes. It is hoped to stimulate and encourage local pigkeepers in the vicinity of Makeni and effectively promote the industry in this area.

175. *Oil Palm Planting Programme.*—The following table shows the expansion of oil palm planting throughout the Circle since 1948:—

1948	1949	1950	1951	1952	1953
3,630	4,455	12,053	52,311	43,396	48,744

1953 was a year of consolidation in the oil palm planting programme within the Circle. The actual planting programme has been handed over to the District Council agricultural staff, the Department organising and advising. During the year there was a revision of policy regarding siting of nurseries and work of District Council Staff, to effect greater efficiency and economy. The eventual objective is an annual distribution of some 30,000 seedlings in each of the Bombali and Tonkolili districts. This is the optimum figure for planting out per district considering the present staff available and the ensuring of high "survival" figures as opposed to merely high "planting" figures.

176. *Coffee.*—Plantations are being resuscitated throughout the Circle. This is due to the very satisfactory price for coffee causing a marked response to departmental propaganda. New plantations are being established and many applications for 1954 plantings have been received. Special attention is being given to coffee establishment in the Tonkolili escarpment area to provide an alternative cash crop to the present hill rice produced for sale from that area.

177. *Chillie Peppers.*—This industry continues to thrive in south Tonkolili and farmers received advice and encouragement throughout the year.

178. *Groundnuts.*—Production in the vicinity of Magburaka received a setback in 1953, when heavy rains at flowering time resulted in considerable blindness and loss of crop.

179. *Soil Conservation.*—In conjunction with the Forestry Department and the Administration early burning of the grassfield areas within the Circle was carried out. An interesting aspect of mechanical cultivation of the Boli lands (grassfield areas also) arises in the replacement of early burning, over annually increasing areas, by ploughing. The ploughed land will in effect act as huge fire-break belts across a portion of the Circle, which in the past was subjected to annual burning.

180. Development of Boli land rice cultivation will, it is hoped and anticipated, reduce land pressure on the upland rice farming areas; especially the Escarpment Zone in the Tonkolili District. In the latter area this is being actively encouraged by the establishment of hillside plantation cropping and " swamp only " rice farming; such work is being undertaken by advice, demonstration and physical assistance (free oil palm and coffee distribution, pegging of tree crops, swamp clearance bonuses, etc.). By such a policy stabilisation of both soil and farming economy is being aimed at.

181. *Agricultural Education.*—Advice and assistance was given to the Magburaka Educational Centre on general layout, gardens, permanent crops, and ornamental plants and vegetable seeds were supplied. Routine visits were paid to Native Administration and mission schools and assistance and advice given on school gardens.

Musaia Circle

Musaia Stock Farm:

182. *Animal Husbandry.*—As the result of experience it was decided by the Animal Husbandry Co-ordinating Committee to discontinue selection by milk recording and to concentrate upon selection and breeding for beef only. Selection by milk yields, necessitating bucket feeding of calves, led to weak calves with little resistance to disease. It was clear that if heavy mortality of calves was to be avoided bucket feeding could not continue and that calves would have to run with their dams, thus making selection by milk yields impossible. This modification of policy has had an immediate good effect, calves being robust and growing quicker. In any case it is doubtful if the Ndama breed would ever become a high milk producer and under natural range conditions it has a better future as a beef than as a dairy herd.

183. The aim at Musaia, therefore, is to produce improved birthweight and growth rate with emphasis on early maturity. Thus " weight for age " is the criterion, with regular calving between April and June each year as opposed to irregular, amongst local herds, and with improvement being made to the normal range conditions. The herd at the end of 1953 totalled 229 and no more purchasing is being done. The present minimum standards for the herd are 36.5 lb. birthweight for heifers and 41.8 lb. for bulls. Calves below this average are to be culled. Exceptional bulls and cows are further recorded, as are their progeny. In this way a sound foundation herd is being built up. As soon as progeny testing can be done, and proven bulls obtained, line breeding will be intensified. Already a few outstanding bulls have been reared, giving calves of up to 50 lb. birthweight.

184. *Future Work.*—At the end of 1953 a comprehensive study of records and working at Musaia with full recommendations for the future breeding policy and extension work was embodied in a report by Mr. T. S. Jones, Senior Agricultural Officer. This report forms the basis of all present and future work at Musaia.

185. *Maintenance.*—During the year various improvements to fencing, roads and dams were done. In addition the gradual laying down of paddocks to *Axonopus africanus* (Yanni grass), the most suitable pasture grass found so far, was continued.

186. *Rice.*—This was grown in the swamps on the farm and in the flood areas produced by the dams.

187. Combined with this cropping have been fertiliser experiments and the multiplication of the legumes, *Pueraria* and *Stylosanthes*. Yanni grass, *Pueraria*, improved rice growing and dam building will play an important part in improving the whole Northern cattle-grazing area, both for livestock and their owners, the

emphasis being upon providing suitable dry season food to shorten the hungry gap which normally occurs towards the end of the dry season. By the time selectively bred improved cattle are available for use in local herds, much of the surrounding cattle country should be in such an agriculturally developed condition as to ensure the best possible feeding for these cattle and with ample rice to attract Fula owners to settle.

188. *Pigs and Poultry.*—In addition to the main cattle work, pigs and poultry are being developed at Musaia. English poultry in particular is in considerable demand and the intention is to breed up a foundation flock of up to 1,000 head of breeding stock.

189. *Diseases.*—The Veterinary Department has worked in close co-operation with the staff at Musaia. Contagious abortion (*Brucella abortus*) and Trypanosomiasis in pigs have been the chief infections. Infected cattle have been isolated and, with the help of the Veterinary Officer, it is hoped to bring the outbreak under control and to prevent further recurrence. Trypanosomiasis in pigs has been checked by inoculation with Antrycide prosalt, but further research is necessary in the treatment of pigs for this disease.

Extension Work:

190. *Cattle Owners Settlement Scheme.*—The chief extension work is Fula settlement, in preparation for the time when improved cattle from Musaia are available for the neighbourhood. By tradition Fula cattle owners have been nomadic in the northern areas, but in the rare places they have been allowed to settle they show a high farming ability, making permanent farms, utilising their cattle for manure and showing evidence in their buildings and technique of a higher standard than is normal in West Africa. In 1951, therefore, it was decided to encourage the permanent settlement of selected Fula cattle owners in Koinadugu District on an organised but gradual scale, with the goodwill and co-operation of the local people. A Fula chief was elected for the first time to the District Council and by 1953 the groundwork for the establishment of selected grazing areas, each one square mile in extent supporting one Fula cattle owner and his herd, had been laid. Each area includes a stream which is dammed at intervals; swamp rice or Yanni grass being grown in the irrigated areas, whilst *Pueraria* seed provided by the Department is given to the Fulas to scatter in the upland to give a permanent leguminous feed. Barbed wire for fencing is provided, as are ox-ploughs and cattle and men trained to ox-ploughing. In 1953 seventeen of these areas were delineated and registered and fourteen allocated. The scheme is run by the District Council under the supervision and advice of the Agricultural Officer, Musaia. It is making a promising beginning and a sign of the confidence now being engendered is the large number of applications being received from cattle owners for more grazing areas.

191. *Ox ploughing.*—Conjointly with the settlement of Fulas is the encouragement of ox-ploughing, and some thirty oxen were trained in 1953 with prospects of considerable future increase. Koinadugu swamp grasslands are mostly small narrow areas more suitable to ox-ploughing than mechanisation, nevertheless in 1953 a total of 163 acres at three sites was tractor-ploughed by the Musaia tractor for local farmers.

192. The usual rearing and distribution of planting materials was continued from Kabala sub-station and Musaia, there being a good demand for coconut, oil palms, citrus and seed rice.

193. The whole area is extremely promising, so litttle agricultural assistance having been given in the past that it is virtually an open field for development. The local population and the Fulas are showing a good appreciation of the assistance now being provided and are responding so well that future development should go ahead at a steady assured rate.

Colony Circle

194. The Colony Agricultural Circle comprises the whole of the Colony Peninsula and Koya Chiefdom in the Port Loko District. The headquarters is at Newton, with an experimental and livestock breeding station, and is established on a

site typical of the undulating lands of the eastern Colony. The soil contains a high proportion of fine sand and is of low natural fertility. Exclusive of the mountain area and the saline mangrove swamp the predominant vegetation is low bush, coarse grasses (*Chasmopodium, Imperata cylindrica*) and oil palms.

195. The heavy rains (over 150 inches), confined mainly to one-half of the year, make the maintenance of soil fertility the main problem. The land not protected by the Forestry Reserve in the hills has been over-farmed by the increasing population. Cassava, which grows slowly but fairly well, is the main crop under cultivation. Tidal and inland swamps are producing rice on an increasing scale, but most of the requirements for the Colony are obtained from the Scarcies and other parts of the Protectorate.

Experimental Station, Newton:

196. *Livestock.*—The main development at Newton in recent years has been the intensive production of pigs and poultry, whilst the flourishing state of the Ndama cattle herd shows that, providing dry season feeding can be maintained, meat production in the Colony area could be on a greater scale than at present. The pig stock was 103 at the end of the year and 83 had been sold during the year. Local pigkeepers have taken advantage of having their sows served by selected boars at Newton.

197. *Poultry.*—This section is flourishing; 1,457 chicks and adult birds, and 5,810 hatching eggs being sold during the year. The stock at the end of 1953 was 829 chicks and adults. Battery and Deep Litter systems were started during the year. The success in expansion has been encouraging. In addition to increasing incubating, a new venture was the trial importation of 200 day-old pullets by air. Of these 75 per cent were reared to eight weeks old and were later distributed to other stations to augment their foundation stock. In 1954 it is intended to build up foundation stock at each of the main agricultural stations to 1,000 head.

198. Ducks, Chinese geese, rabbits and guinea pigs all thrive at Newton, there being 204 ducks, 89 geese and numerous rabbits and guinea pigs now on hand, with regular sales to the public. Expansion of all livestock and poultry at Newton is only limited by the availability of cheap local or imported foodstuffs and is directly correlated with the state of the rice crop.

199. *Tree Crops.*—There has been a welcome revival in coffee planting in the Colony area, 15,000 seedlings being distributed in 1953. Fruit such as avocado, citrus, coconuts is in good supply, especially in villages surrounding Newton, and is adequate testimony to the years of steady seedling distribution. Improved oil palm seedlings are reared in quantity at Waterloo nursery and used for the establishment of the Waterloo Oil Palm Plantation.

200. *Model Holding.* This, which serves as an example of efficient peasant farming in this area, was established in May, 1951. Limited financial assistance will be provided for capital work for a three-year period and technical assistance will be freely available at all times. The holder was successful with swamp rice and vegetable cultivation and the raising of citrus seedlings for local sale. This year livestock was included in his activities. A four-pen piggery was built in the first quarter and foundation stock of pigs and poultry supplied. This new line proved a great success and constitutes a steady source of income.

201. *Rural Education and Propaganda.*—Not the least function of Newton Station is its growing educative and propaganda value. Visitors of all types from school children, farmers, urban dwellers to Ministers, Chiefs, clerks and others are constantly being shown round the station and the extension developments, livestock and poultry are particular attractions.

Extension Work:

202. *Swamp Development.*—In the degraded over-farmed Colony area development of all the available swamps is of prime importance and every acre so developed is invaluable. With the exception of saline tidal and mangrove creeks

there are comparatively few swamps in the Colony area. By the end of 1953, 150 acres of *Avicennia* mangrove had been empoldered at Maswari, near Newton, of which 130 acres were cultivated. In addition 200 acres of mangrove were felled at Songo Creek area under a loan scheme run by the Rural Areas Council, whilst at Fogbo 300 acres were cultivated. Sixty acres of inland swamp were cleared at Campbell Town. Thus a total of 690 acres of waste swamp land is now cleared or under rice cultivation. Yields, in general, from the swamps are quite good, averaging 1,100 to 1,200 lb. paddy per acre with a maximum around 1,600 lb. A fertiliser trial gave significant economic yield increases from superphosphates at levels ranging from ¾ cwt. to 2 cwt. superphosphates per acre.

203. Vegetable production in freshwater swamps for the Freetown market shows a steady increase whilst a Model Holding at Newton is successfully demonstrating how pigs and poultry can be a profitable development on the uplands surrounding a rice swamp.

204. *Waterloo Oil Palm Plantation.*—Consolidation of the 628 acres planted was the main operation in 1953. Due to fires, rodents and deaths from other causes, considerable replacement was necessary. Arrangements were made to obtain wire netting " collars " to prevent rodent damage in the areas where it was most serious.

205. The nursery was extended to twice its original size, mainly in a swamp area where by simple water control measures the cost of watering has been reduced to a minimum. At the end of the year some 72,000 seedlings had been planted in nursery beds.

206. Some 3,300 seedlings were distributed to local farmers. The number was limited due to the new minimum limit on seedling size for transplanting—observations having shown that excessive losses occur if small seedlings are distributed.

C—Horticultural Section

207. The work of this section has continued to increase as it has become more widely known and appreciated, not only in the Colony area but beyond.

208. *New England.*—The headquarters of the section are situated here, close to Freetown, where trials of new varieties, fertilisers and plant sanitation are carried out. It is also a centre for the raising and distribution of ornamental plants. Further terracing was completed in order to extend the cultivated area, improvements were made to the office surrounds, and the construction of a new plant propagating house was started.

209. *Onions.*—It was found that the application of potash to onions was of little use, and that shading reduced the weight of bulbs produced, though the length of leaves was increased. Onion leaves are nearly as valuable locally as the bulbs.

210. *Tomatoes.*—Kabala varieties of tomatoes which have been under trial and selection for resistance to bacterial wilt appear to have lost their original resistance. The use of formalin as a soil steriliser has given promising results in the control of this disease. Tomatoes were grown successfully in pure sand watered with a solution of inorganic nutrients.

211. *Lumley.*—The lay-out of the Vegetable Demonstration Garden has been completed and the whole area is now devoted to trials with new vegetables, fertiliser and cultural experiments and demonstrations of tried methods of vegetable growing suitable for the locality.

212. *Fertiliser Trials.*—It was found that sulphate of ammonia alone reduced the yields of cabbage and cauliflower, whilst superphosphate was most effective in increasing yields. Beetroot and Chinese cabbage responded well to applications of 2 ounces per square yard of superphosphate, but sulphate of ammonia alone had a depressing effect on the latter. The yield of spring onions was reduced by dressings of superphosphate, which induced premature ripening and a reduction in the size of the bulbs. Shading in the early stages of growth was beneficial.

213. *Groundnuts.*—Variety trials with local groundnuts indicated that Satema and Konkodugi were most resistant to leaf spot, and the heaviest yields were given by Maras, Mbanya, Nikile and Satema. The best ground cover was produced by Konkodugi and Kolasaba.

214. *Coconuts.*—These were found to germinate more rapidly if soaked in salt water for seven days.

215. *Sunken beds.*—The use of sunken beds in the dry season gave results which were superior to those from the conventional raised beds.

216. *Burnt Rice Husk.*—This is a by-product from the Government Rice Mill and has been tried out as a fertiliser on seed beds and growing crops. Heavy dressings are needed, of the order of 3 lb. per square yard, to produce results comparable with those of the usual fertilisers. Cultivation has been carried out wherever possible by garden tractor, and watering by overhead irrigation in order to keep down labour costs.

217. *Distribution of Citrus.*—The propagation of fruit trees, mainly citrus, has been continued actively, and some 3,500 were distributed this year compared with 968 in 1952. Mainly budded or grafted trees were supplied, and in some cases the demand exceeded the supply.

218. *Pigs and Poultry.*—The piggery was completed and at the end of the year stock consisted of a boar, two gilts and three hogs. Visitors showed considerable interest in this feature of the station, which is intended to demonstrate the inter-dependence of livestock keeping and vegetable gardening. In addition a pen of twelve Rhode Island fowls was established. Some difficulty was found in obtaining adequate supplies of food for livestock, but a reasonable standard of nutrition was maintained.

219. *Gloucester.*—The demonstration garden continued to serve its purpose of bringing the use of fertilisers and improved varieties to the notice of visitors and neighbouring vegetable growers. Seedlings and samples of fertilisers were distributed to interested growers to try on their own land. The garden has also proved useful as a trial ground and for seed production of garden egg, tomato, lettuce and beans. The Agricultural Instructor in charge of this garden continued his visits to local growers to advise them on fruit and vegetable cultivation and the control of insect pests. In this connection it was found that an emulsion of one part Diesel oil in ten parts of water applied to the soil at half a gallon per square yard was effective in controlling the " Yonni " ant, which carries away seeds after they have been sown. The application of this emulsion seven days before planting gave almost complete control and was not harmful to the subsequent crops.

220. *Rural Areas Council Nursery (Regent).*—This nursery has made satisfactory progress under the supervision of the Agricultural Instructor advising in the mountain districts. The contour terracing of the upland portion was completed and it was planted with over 3,000 sour orange seedlings for budding in 1954. Many other seedlings and cuttings of economic plants such as coffee, cacao, pink-apple, pineapple, etc. have been established on the upland and will be ready for distribution in 1954. The store and " advisory bureau " have been completed and fertilisers have been on sale from this bureau to local growers. Advice has been available to growers on application, and periodical visits have been paid by the staff to gardens in the area. Spraying of crops against insect pests has been done by the Junior Agricultural Supervisor on request from local gardeners.

221. Seeds purchased by the Rural Area Administration have been resold to gardeners at cost price, but efforts have been made to encourage a local grower to undertake this function.

222. The swamp portion of the garden has been cleared, drained and levelled in preparation for vegetable cultivation in the dry season. There is approximately one acre of swamp land available for vegetable cultivation and the utilisation of this for cultural trials and fertiliser experiments will afford additional information to that already obtained from the Demonstration Garden at Lumley, which is at sea-level.

223. Burnt rice husk, decayed rice husk and vegetable compost have all been used at Regent with success; particularly outstanding has been the response of sour orange seedlings to applications of burnt rice husk. An experiment using fertilisers on Dwarf Bean, variety " Premier," indicated that nitrogen was lacking in this type of swamp soil but that dressings of a complete mixture of N.P.K. increased yields significantly.

224. A section of unterraced upland has been contour-planted with pineapple and lemon grass as a demonstration of one method of soil conservation which does not involve terracing.

225. A semi-rotary hand pump is now in use in the nursery as a means of irrigation, and many visitors to the garden have expressed interest in this form of irrigation.

Extension Work:

226. Agricultural Instructors combine district work with the supervision of the demonstration gardens in their charge. The use of fertilisers and new varieties of vegetable seeds, particularly onions, has been demonstrated to interested growers on their own land, and many have adopted their regular use. Attention has been paid to the encouragement of school gardens, in the hope that any interest aroused in the younger generation may persist in later life.

227. *Horticultural Show.*—The second annual Horticultural Show was held at Regent on 1st April and it was well attended. The number of entries was greater than last year.

228. The Horticulturist gave a number of gardening talks over the Freetown radio re-diffusion service and a series of horticultural notes was prepared for local distribution.

D—Njala Training College.

229. *Agricultural Course.*—During the year nine senior students successfully completed their course of training at the college. These students were then posted as Agricultural Instructors to various agricultural stations, and reports from their Agricultural Officers indicate that they were well satisfied with their standard and ability. Ten students completed their second years' study at the college and are due to proceed in 1954 to their final year. Although this group were weak at first, the progress in their second year (1953) has been very satisfactory, and they should eventually become useful Agricultural Instructors of good quality.

230. During the year eighteen new students were recruited and they completed their first term in November, 1953. Generally speaking the standard of this group was below normal and it was found necessary to withdraw four of the scholarships in December owing to lack of progress.

231. The lectures and practical work were based on the revised syllabus, the lectures comprising Agriculture, Surveying, Farm Implements and Machinery, Agricultural Chemistry, Zoology, Agricultural Botany, Farm Management, Anatomy and Physiology of Farm animals, Nursery Practice, English, Arithmetic and Carpentry, with the usual interchange of Education and Agricultural Staff.

232. Practical work during the year included maintenance of the permanent blocks; cultivation of the annual blocks with cassava, maize, rice, guinea corn and Musaia cow-pea; the establishment of a Robusta coffee plantation and the laying-out of a new grass block. Throughout the year the Allen Auto-Scythe was in constant use by the students, who learnt to handle it capably, and it has proved itself to be a very valuable implement on the college farm. A considerable amount of inter-cropping was carried out in the permanent blocks, the crops grown comprising groundnuts, cassava, sweet potatoes and pineapples.

233. In the livestock section the position remained static as it was not found possible to construct the new piggery and cattle byre. However it is expected to carry out this work in 1954 and development will then become possible. The rabbits, hens and ducks continued to do well on a modest scale

234. A new incubator was received during the year and the students were given instruction in its use. It is proposed that during the students three-year course all will have had some practice and experience in the use and care of this incubator. There is no doubt that this is a valuable acquisition to the farm.

235. During the year two treks were made by the students. The first took place in May, when the third-year agricultural students visited Musaia Livestock Station, the Veterinary Department, Teko, and the mechanical ploughing sites in the Makeni Circle. These students were also fortunate in being able to attend the Kabala Agricultural Show while they were at Musaia. The students gave some assistance in the preparation of the show ground and also witnessed the judging of the exhibits. This proved a very instructive and interesting trek. In November the second-year students visited the cacao areas in the Kenema and Pujehun districts. Whilst at Kenema, apart from trips to places of agricultural interest visits were made to the Kambui Forest Reserve, where the students were shown how the timber is extracted from the reserve and also the different methods of replanting forest trees; to the sawmill in Kenema, and to the rice mill in Kenema. From Pujehun a trip was made to Futa where the students were shown in detail the methods of fermentation of cacao, and a visit was made to one of the cacao plantations. A further trip was also made to Bumpe, where the students saw another cacao fermentary and also prepared piassava for themselves. Whilst the students were at Pujehun they visited the mechanical ploughing sites at Gbundapi and the Pioneer Oil Palm Mill at Sahn.

236. 1953 has been a year of progress; unspectacular but nevertheless solid and satisfactory despite shortages of funds and equipment which are expected to be remedied next year, and this will make further expansion possible in 1954. The training of the students has at no time suffered as a result of shortages and much hard and successful instructional work has been carried out.

E—Research

Plant Pathology Section

237. The Plant Pathologist proceeded on leave on August 27th and returned to Sierra Leone on December 17th, having visited the West African Cacao Research Institute, Tafo, Gold Coast, en route from the United Kingdom, from December 7th to 17th. While on leave he spent four weeks working in the Commonwealth Mycological Institute.

238. The Plant Pathologist reports as follows:—

(1) Some 400 collections of fungi were made during the year and sent to the Commonwealth Mycological Institute and Kew Herbarium, duplicates being kept at Njala. Thanks are due to the staff of both these institutions for assistance with identifications.

(2) A collection of lichens, mostly on the bark of trees around Njala, was sent via the Royal Botanic Gardens, Kew, to Dr. C. W. Dodge in the United States of America, who has kindly identified about sixty lichens, including forty-four new species and varieties and one new genus. Dr. Dodge included an account of these lichens in his paper "Some Lichens of Tropical Africa," Ann. Mo. bot. Gard 40, 1953, pp. 271–401.

(3) The phanerogamic herbarium remained under the Plant Pathologist's supervision during the year. About 300 phanerogamic collections were made during the year, most by Mr. H. D. Jordan and by Plant Pathologist's Section and were sent to Kew Herbarium, duplicates being placed in the herbarium at Njala. During the year all the collections of ferns in the Njala herbarium were sent on loan to the British Museum (Natural History), where Mr. A. H. G. Alston kindly checked identifications in connection with the revised edition of the Flora of West Tropical Africa.

(4) *Rice.*—Mr. W. Jackson, Botanist, West African Rice Research Station, Rokupr, reports that *Ephelis pallida* (*Balansia* sp.) occurred in the 1953–54 season on seventy-seven panicles in a 1/3 acre plot of D. 99 (i.e., about one infected panicle in 2,000), and to a very small extent on very small plots of the following varieties; 1/18, Sagama and G.E.B. 24/9.

Smut (*Neovossia horrida*).—Mr. T. S. Jones, Senior Agricultural Officer, collected this fungus on the wild stoloniferous rice *Oryza barthii* in January, 1953 from Kiban Island (Nongoba Bulom), Bonthe District. Only about one grain per panicle was infected and only one panicle in 20 or 30 panicles contained an infected grain. In December, 1953 Mr. W. Jackson forwarded from Rokupr Rice Research Station a single smutted grain of *Oryza sativa*. var. Raminad, a variety introduced from the Phillipines early in 1952. This is believed to be the first record of *Neovossia horrida* on rice in Africa and the first record of this smut on a rice species other than *O. sativa*. The disease is of no economic importance.

(5) *Minor Records Included:* a common leaf blotch of Eucalyptus (2 spp.) at Regent (Colony), which was associated with *Cylindrocladium* sp. A leaf blotch of the white Frangipani (*Plumeria acutifolia*) at Njala was also associated with a species of *Cylindrocladium:*

Septoria lactucae Pass. on leaves of old lettuce plants at Lumley (Colony);

Cercospora granuliformia Ell. and Holw. on old leaves of *Viola odorata* at Njala;

Sclerotium coffeicola Stahel on leaves of *Bauhinia variegata* at Njala;

Piricularia grisea (Cke.) Sacc. on leaves of *Guaduella oblonga* at Gebwema (Tonkia);

Uromyces commelinae Ck. on *Aneilema paludosa* near Mateboi;

Torula herbarium (Pers.) Link ex Fr. on bulbs of onion at Lumley (Colony), producing smut-like spore masses in longitudinal streaks between the dry outermost bulb scales and the inner fleshy scales;

Pleocyta sp. on leaves of Bulrush millet (*Pennisetum leonis*) near Njala;

A leaf blotch of Bulrush millet (*Pennisetum leonis*) near Njala was associated with a small agaric which has been identified as *Marasmius* sp. akin to *M. paspali* Petch. A very similar leaf blotch of maize has also been collected from Sierra Leone, associated with a very similar fungus;

Fomes sonex (Nees and Mont.) Cke. is a common parasite of *Albizzia adianthifolia*, and has also been recorded as a parasite of *Deniellia thurifera* at Kenema.

Agricultural Chemistry Section

239. The Agricultural Chemist was on leave from March until August and because of this it was not possible to perform any major experiments. The staff situation remained difficult and all efforts to recruit qualified Junior Staff have failed. It was thus necessary to limit the number of routine soil analyses carried out in order to allow sufficient time for research.

240. *Laboratory Investigations.*—Some 300 soil samples were analysed for advisory purposess by the usual methods. In previous years difficulty had arisen in predicting the quantity of superphosphate to apply to swamp soils. Although the great majority of swamps are highly deficient in phosphate it has not been easy to assess how much should be added to give an optimum response in the succeeding crop. A large number of simple fertiliser trials were carried out in swamps all over the country and from each site a soil sample was taken. Each sample was analysed for "available" phosphate by the Truog method and by the Purdue Quicktest method. There was no correlation between the two series of results and neither correlated with the increase in yield of rice due to applications of superphosphate. It was also noted in some analyses of groundnut plants that superphosphate applications are not reflected in the phosphate extractable from leaves although there was a marked increase in growth and yield. Other methods of analysis will be tried on these soil samples to see if any correlations can be obtained, but in any case one possible solution to this problem is given below in the section on field experiments.

241. A considerable number of leaf analyses were performed in connection with pot experiments on groundnuts. With an extension of work on minor elements and other unusual nutrient elements much time was spent on perfecting methods of analysis which could be used for rapid routine determinations next year.

242. *Pot Experiments.*—Several of these were carried out to determine nutrient deficiencies in soil from Malal near Port Loko and from Njala. In the field superphosphate had failed to give responses at Malal, but it gave a very marked response in pots, increasing the yield by 100 per cent. None of the other treatments had any effect on the yield of mature nuts, but Manganese, Boron, Zinc and Copper increased the number of embryos. Manganese, Boron and Molybdenum all advanced the flowering date, increased the total number of flowers and increased the weight of leaves. The same treatment also increased the phosphate content of leaves but superphosphate did not. This crop was previously known to respond to superphosphate at Njala, and this was the only fertiliser which had any effect on the yield. Maganesium, Calcium and Manganese noticeably increased growth and the weight of leaves sampled. Boron, Zinc and Copper reduced growth, but conclusions from this experiment are doubtful as there was a severe attack of " rosette."

243. An attempt was made to show nutrient deficiency symptons in groundnuts by sand culture. An absence of deficiency symptons would show that either the technique was poor or that the groundnut had sufficient of that element in the seed. The symptoms and yields are shown in the table below:

Deficiency	*Symptoms*	*Yield of Nuts*
Nitrogen	Plant very chlorotic and dead within a month	Nil
Phosphorus	Stunted plant. Leaves dark, small and narrow and bunched near growing point	Nil
Potassium	Tall spindly plant. Leaves long and narrow, yellow with interveinal chlorosis. Lower leaves dying back from tip	Nil
Calcium	Similar to potassium deficieny but no interveinal chlorosis and leaves broader	2
Magnesium	As Calcium	3
Boron	Healthy Plants	16
Copper		20
Zinc		9
Molybdenum		7
Manganese		14

Thus deficiencies have been shown for the major nutrient elements but not the minor ones. It is probable that some of these, at least, are carried by the seed in sufficient quantity for a season's growth.

244. Other simple pot experiments were carried out to discover if sulphate of ammonia was detrimental to citrus and oil palms. Sour orange seedlings and young oil palms were treated with equivalent quantities of sulphate of ammonia and sodium nitrate, in Njala upland soil. For both plant types growth was much better with the nitrate fertiliser. Sulphate of ammonia caused worse growth than the controls. In March all citrus trees on Njala farm had heavy dressings of a mixed fertiliser which included sulphate of ammonia. The check which occurred in their growth can be explained by this experiment. It seems likely that the change from ammonia to nitrate ions is very slow in these soils and direct ammonium toxicity occurs.

245. *Fields Experiments on Rice.*—147 simple fertiliser trials were laid down in swamps in many parts of the country, to find the optimum quantity of superphosphate to apply and to find the best time of application. For convenience, swamps have been divided into three groups; (*A*) Bonthe Grasslands, (*B*) Mangrove Swamps, (*C*) Inland Swamps.

246. (*A*). In the Bonthe Grasslands there was little response to less than 1½ cwts. superphosphate per acre. These areas are naturally of high fertility and although heavy applications of superphosphate gave marked increases in yield it is unlikely that these would be considered profitable at the present time.

247. (*B*). In Mangrove swamps the response was proportional to the quantity of fertiliser applied, up to 1½ cwts. per acre. Above this quantity the response gets less and maximum yield is reached with a dressing of about 3 cwts. per acre, 80 per cent above the unfertilised yield.

248. (*C*). For inland swamps there was little response below ½ cwt. per acre superphosphate and a maximum yield increase of 60 per cent was reached with 1½ cwts. per acre.

249. As was reported there was no correlation between the available phosphate in the soil and the response to added superphosphate. However, there was a very close correlation between the control yield and the response to a given quantity of fertiliser in both inland and mangrove swamps. In the former the response was inversely proportional to the yield without fertiliser, and in the latter directly proportional. In inland swamps the lower the fertility the greater the response to superphosphate, and so it seems that phosphate is the major factor limiting growth. In mangrove swamps the higher the initial fertility the greater the response, so that low fertility in these swamps is caused by some other factor not yet discovered.

250. The best time of application of superphosphate was found to be on the seed-bed, just before planting the rice. This was also true for transplanted rice, although an extra application at the time of transplanting was highly beneficial.

251. *Field Experiments on Groundnuts.*—Although an application of 2 cwts. per acre of superphosphate is usually recommended, at Njala it was found that a maximum profit is obtained with 4 cwts. per acre. An experiment also showed that triple superphosphate is just as effective as superphosphate in equivalent quantities. Triple superphosphate has about 50 per cent P_2O_5 whilst ordinary superphosphate has only 18 per cent. Although the cost of triple superphosphate is slightly higher, the cost of transport per unit P_2O_5 is only 40 per cent of that of superphosphate. Thus the use of the concentrated fertiliser will give higher profits and should be encouraged.

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252. As the officer who was to have taken up the duties as Systematic Botanist/Ecologist could not be released from field duties due to shortages of staff, routine work was continued by the Plant Pathologist, who has reported on the phanerogamic herbarium elsewhere in this Report.

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